SOFTWARE DESIGN DOCUMENT

FOR THE

GENERIC AVIONICS DATA BUS TOOL KIT

Prepared For:

Ada Joint Program Office

Ada Technology Insertion Program

Prepared By:

Computer Technology and Simulation Department

Systems Engineering Test Directorate

Flight Test Engineering Group

Naval Air Warfare Center / Aircraft Division

Patuxent River NAS, MD 20670

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13. ABSTRACT *(Maximum 200 words)*

This Software Design Document describes the structure of the Generic Avionics Data Bus Tool Kit (GADBTK), which is part of the Ada Technology Insertion Program's (ATIP) Ada binding project. The Computer Software Configuration Item (CSCI) described in this design document is a collection of related routines that will be combined to form a bus monitor application. The primary goal of the project is to produce reusable data bus software components.

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TABLE OF CONTENTS

LIST OF FIGURES

1 SCOPE

1.1 Identification

This Software Design Document describes the structure of the Generic Avionics Data Bus Tool Kit (GADBTK), which is part of the Ada Technology Insertion Program's (ATIP) Ada binding project. The Computer Software Configuration Item (CSCI) described in this design document is a collection of related routines that will be combined to form a bus monitor application. The primary goal of the project is to produce reusable data bus software components.

1.2 System Overview

The Air Combat Environment Test and Evaluation Facility's (ACETEF) Maned Flight Simulator (MFS) laboratory is a man in the loop high fidelity flight simulator that was designed to provide avionics system stimulation to actual aircraft hardware components while pilots are flying simulated combat scenarios. Other ACETEF laboratories provide radio frequency (RF) simulation/stimulation and environment simulation. The output of the simulations at the various component laboratories can be combined to provide system stimulus to an actual aircraft which is suspended in an RF shielded anechoic chamber. Alternately individual subsystem can be stimulated and tested in a laboratory setting. The ACETEF is used to test the electronic systems of an aviation platform in a completely secure ground test facility at substantial cost savings over conventional flight testing. The Generic Avionics Data Bus Tool Kit (GADBTK) CSCI will be used in the ACETEF to provide simulation software interface to the actual system data buses under test. It will also supply monitor and diagnostic tools to aid in evaluating the test equipment.

Additional requirements for a robust Ada - 1553 binding were added because funding for this project was underwritten by the Ada Technology Insertion Program (ATIP) which is sponsored by the Ada Joint Program Office (AJPO) to promote Ada reuse in the DOD community.

1.3 Document Overview

This document will detail the preliminary and detailed design of each Computer Software Component (CSC) / Computer Software Unit (CSU) that comprise the Generic Avionics Data Bus Tool Kit. The preliminary design will focus on the object relationships that exist within the system. The documentation of these relationships will include pictorial information as well as text to support the design. The primary drawing convention used in the entity relationship diagrams is the Bohr method. The detailed design will specify the entire system in Ada. The document is intended to capture the rational of the design structure of the code. This document will also provide requirements traceability to show how each part of this design meets specific requirements analysis criteria.

2 REFERENCED DOCUMENTS

2.1 Government Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

STANDARDS:

Military

MIL-STD-1553B, 8 September 1986	Digital Time Division Command/Response Multiplex Data Bus
MIL-STD-1815A, 22 January 1983	Ada Programming Language
DOD-STD-2167A, 29 February 1988	Defense System Software Development

2.2 Non-Government Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

STANDARDS:

AA-EF88A-TE, February 1985	VAX Ada Programmer's Run-Time Reference Manual
F-6/89-10M, 1988	MIL-STD-1553 Designer's Guide, DDC ILC Data Device Corporation
ISBN 0-442-23805-3, 1989	Ada Quality and Style, The Software Productivity Consortium
MFS Users Manual, Volume 3	Software Style Guide and Configuration Management.

3 PRELIMINARY DESIGN

3.1 CSCI Overview

The purpose of the Generic Avionics Data Bus Tool Kit CSCI is to provide the necessary interface building blocks for applications written in the Ada programming language to transfer data on the MIL-STD-1553 multiplex data bus. The abstraction is to provide sufficient hardware independence that only the hidden low level hardware interface specific procedures need be modified to allow operation on different hardware platforms. The tool kit will provide all data structures and operators needed to interface with a standard 1553 implementation. In addition to bus primitives a set of reusable units will be developed to facilitate building 1553 applications. These units will be used to build an engineering monitor/emulator application. The bus monitor application is the actual system that the design is focused on. Throughout this design the bus interface is treated as a part of the monitor application however a separate context diagram is shown for the interface to emphasize the independent nature of that component.

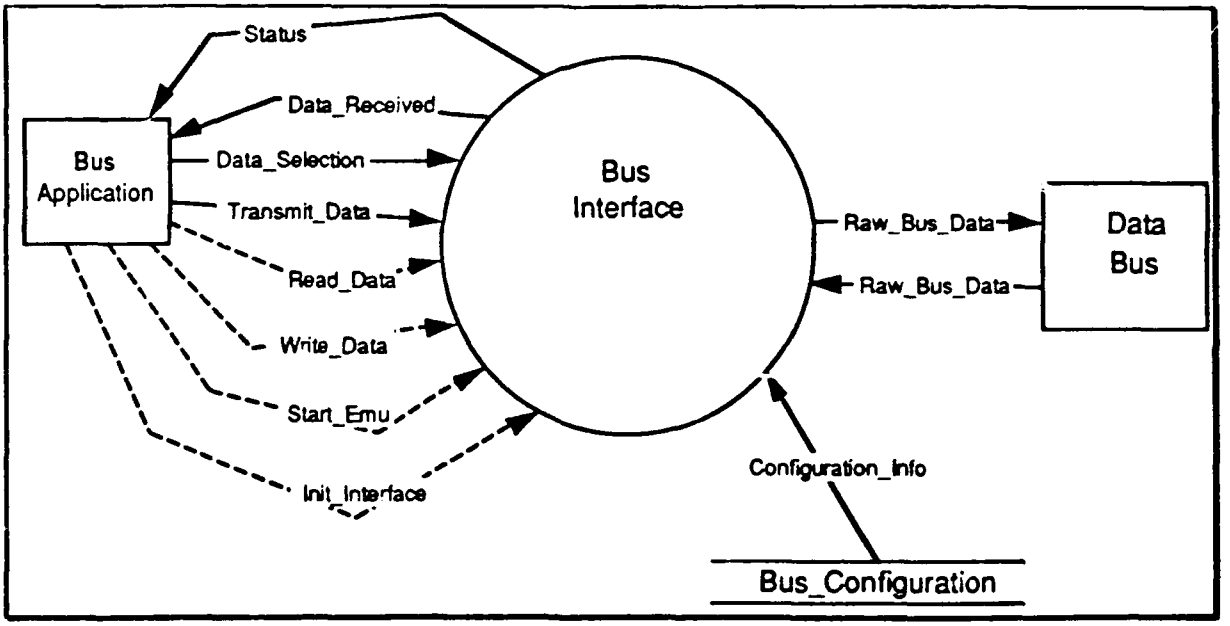


Figure 1 1553 Bus Interface System Boundaries

• INTERFACE DEFINITIONS

Configuration_Info =

BNF: Default_Bus_Number + Interface_Number + Interface_Address + Machine_Type

Data_Received =

BNF: {Bus_Word}

Data_Selection =

BNF: RT_Num + (SA_Num) + (Tran_Rec) + (Bus_Num) + (Watch_Mask)

Raw_Bus_Data =

BNF: {Bus_Word}

Transmit_Data =

BNF: {Bus_Word}

Status =

BNF: [Normal + Bus_Error + User_Error + Config_Error]

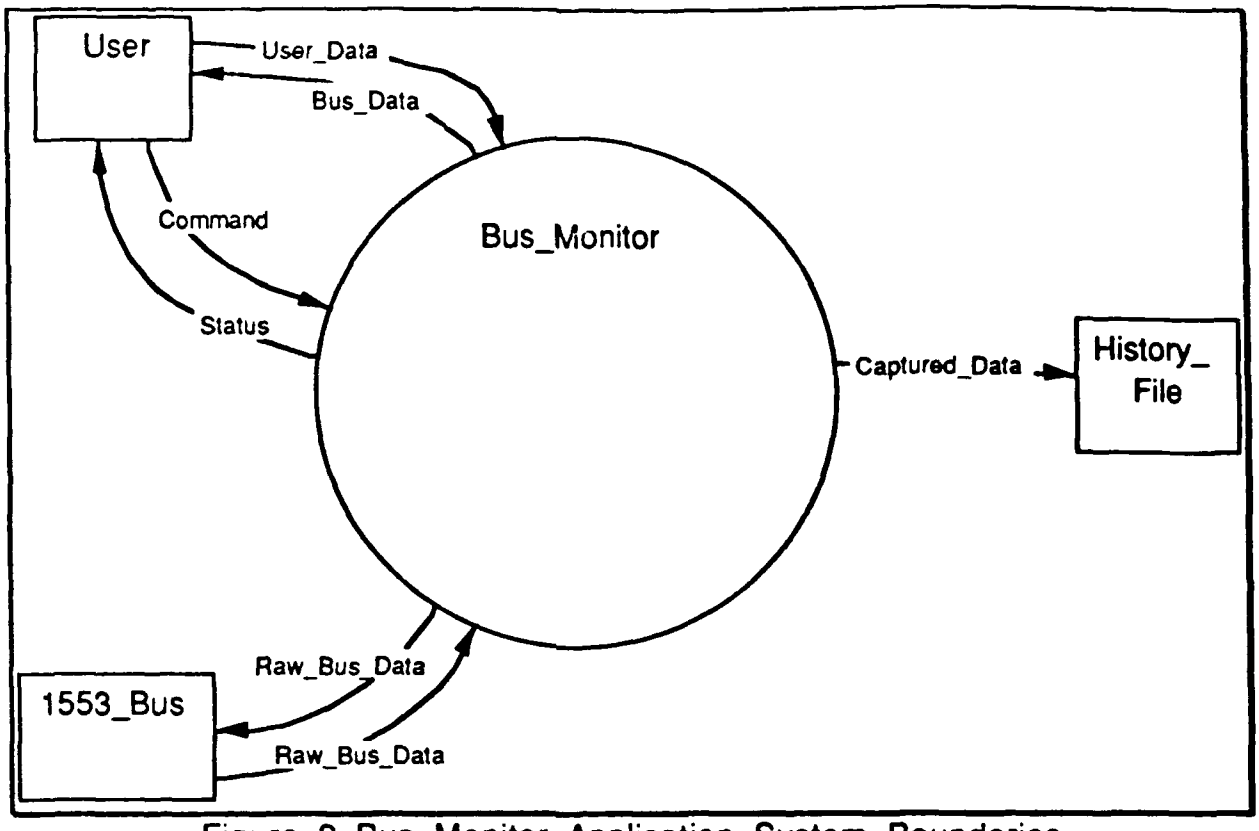


Figure 2 Bus Monitor Application System Boundaries

• INTERFACE DEFINITIONS

Bus_Data =

BNF: [RT_Status | Bus_Message]

Captured_Data =

BNF: {Bus_Word}

User_Data =

BNF: [RT_Num | SA_Num | Tran_Rec | Bus_Num | Bus_Message | Out_File | Update_Rate | Output_Mode | Watch_Mask]

Command =

BNF: {Character}

Comments: Command input from user is an unformatted string that must match one of the valid commands.

Data Type: String

Data Representation: alpha_numeric

Data Size: 80 bytes

3.1.1 CSCI Architecture

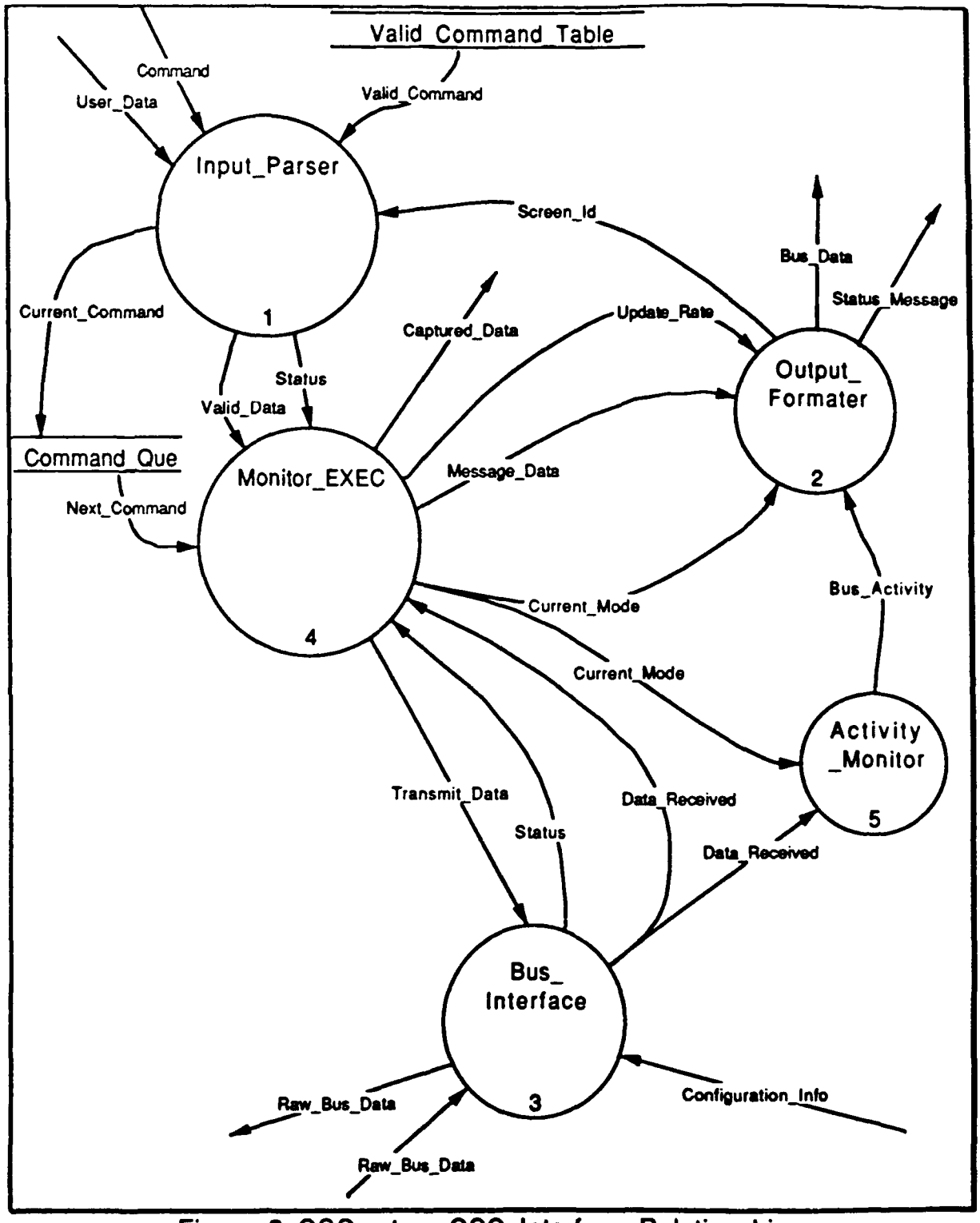


Figure 3 CSC - to - CSC Interface Relationships

3.1.1.1 Bus_Interface to Monitor_Exec

Transmit_Data =

BNF: {Bus_Word}

Bus_Word =

Data Type: Unsigned_Word

Data Representation: numeric

Data Size: 2 bytes

Data Range: (0, 65536)

Bits: 16

Status =

BNF: [Normal + Bus_Error + User_Error + Config_Error]

Data_Received =

BNF: {Bus_Word}

Bus_Word =

Data Type: Unsigned_Word

Data Representation: numeric

Data Size: 2 bytes

Data Range: (0, 65536)

Bits: 16

3.1.1.2 Bus_Interface to Activity_Monitor

Data_Received =

BNF: {Bus_Word}

Bus_Word =

Data Type: Unsigned_Word

Data Representation: numeric

Data Size: 2 bytes

Data Range: (0, 65536)

Bits: 16

3.1.1.3 Monitor_Exec to Activity_Monitor

Current_Mode =

BNF: [Hex + Decimal + Octal + Binary + Formatted + Activity + Preferred_Data + Idle + Logging]

Data Type: Mode_Type

3.1.1.4 Monitor_Exec to Input_Parser

Command_Que =

BNF: {Current_Command}

Current_Command =

BNF: [Select_RT + Select_SA + Select_TR + Select_Bus + Set_Display_Mode + Set_Log_Mode + Start_Logging]

Data Type: Command_Type

Data Representation: Enumeration

Next_Command =

BNF: Current_Command

Current_Command =

BNF: [Select_RT + Select_SA + Select_TR + Select_Bus + Set_Display_Mode + Set_Log_Mode + Start_Logging]

Data Type: Command_Type

Data Representation: Enumeration

Valid_Data =

BNF: [Integer | String | Enumeration]

Status =

BNF: [Normal + Bus_Error + User_Error + Config_Error]

3.1.1.5 Monitor_Exec to Output_Formatter

Update_Rate =

BNF: Seconds

Comments: This message to the output formatter expresses how often to refresh the screen.

Data Type: Integer

Data Representation: numeric

Data Range: (0, 60)

Default Value: 3

Units of Measure: Seconds

Accuracy: 1

Message_Data =

BNF: Message_ID_Block + Message_Content

Message_ID_Block =

BNF: Message_Type + (Window_Id)

Message_Content =

BNF: [{Character} | {Bus_Word}]

Comments: This field contains the text of the message to be displayed

Data Type: String

Data Representation: alphanumeric

Message_Type =

BNF: [Info + Error + Bus_Data + Prompt]

Data Type: Output_Message_Type

Data Representation: enumeration

Window_Id =

Data Type: Integer

Data Representation: numeric

Data Size: 1 byte

Data Range: (1, 4)

Default Value: 1

Current_Mode =

BNF: [Hex + Decimal + Octal + Binary + Formatted + Activity + Preferred_Data + Idle + Logging]

Data Type: Mode_Type

3.1.1.6 Output_Formatter to Input_Parser

Screen_Id =

Column + Line

Line =

Data Type: Integer

Data Representation: numeric

Data Range: (1, 24)

Default Value: 1

Column =

Data Type: Integer

Data Representation: numeric

Data Range: (1, 80)

Default Value: 1

3.1.1.7 Output_Formatter to Activity_Monitor

Bus_Activity =

BNF: {RT_Status}

RT_Status =

BNF: [Active + Inactive + Unknown + No_Response]

Comments: Most recently observed status of a given RT

Data Type: An_RT_Status

Data Representation: enumeration

3.1.2 System States and Modes

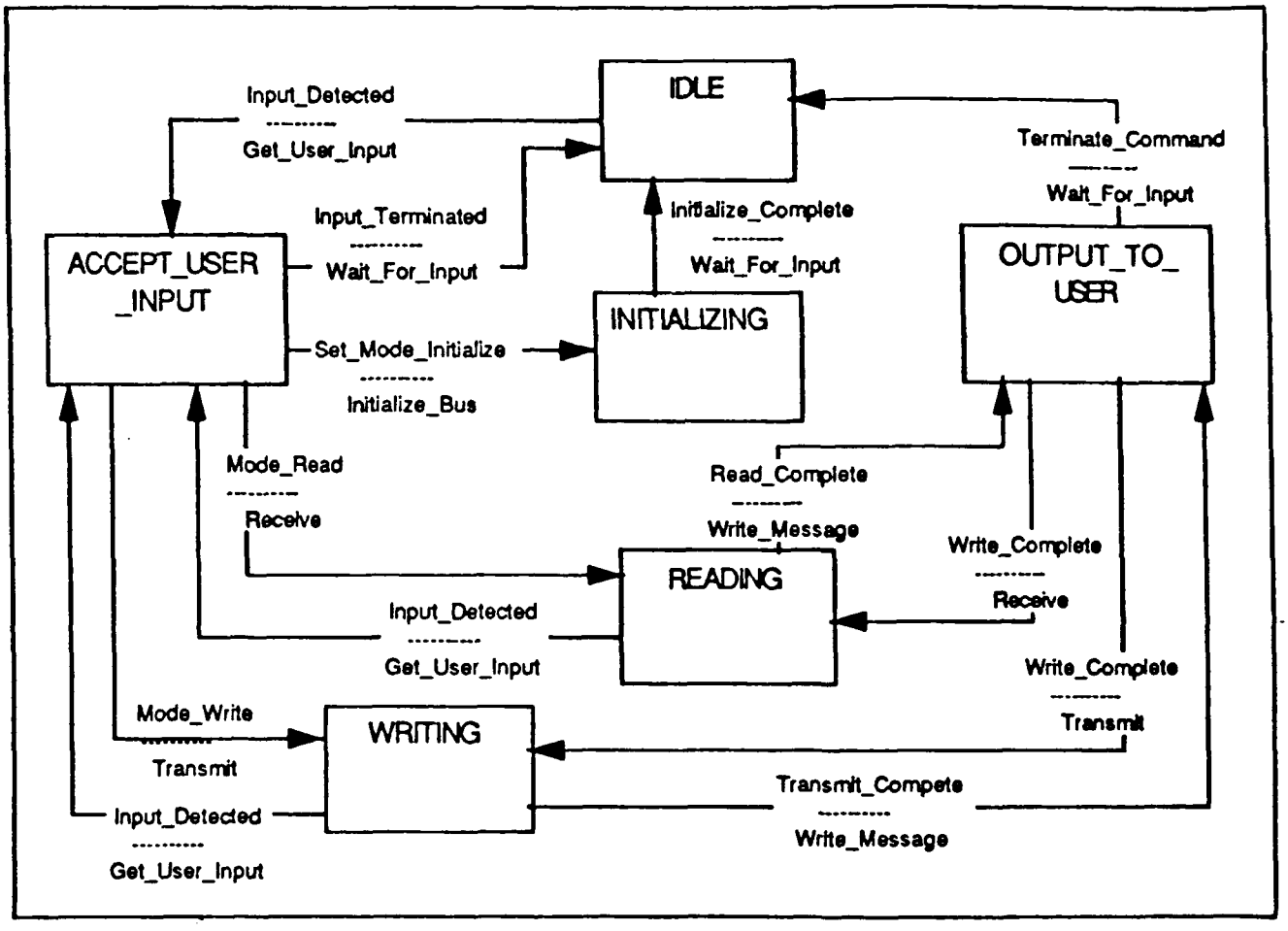


Figure 4 Monitor Application State Transition Diagram

STATE	EVENT	ACTION	NEXT STATE
ACCEPT_USER_INPUT	Input_Terminated	Wait_For_Input	IDLE
	Mode_Write	Transmit	WRITING
	Mode_Read	Receive	READING
	Set_Mode_Initialize	Initialize_Bus	INITIALIZING
IDLE	Input_Detected	Get_User_Input	ACCEPT_USER_INPUT
INITIALIZING	Initialize_Complete	Wait_For_Input	IDLE
OUTPUT_TO_ USER	Terminate_Command	Wait_For_Input	IDLE
	Write_Complete	Receive	READING
	Write_Complete	Transmit	WRITING
READING	Read_Complete	Write_Message	OUTPUT_TO_ USER
	Input_Detected	Get_User_Input	ACCEPT_USER_INPUT
WRITING	Transmit_Compete	Write_Message	OUTPUT_TO_ USER
	Input_Detected	Get_User_Input	ACCEPT_USER_INPUT

Table 1 Monitor Application State Transition Table

CSC \ State	IDLE	ACCEPT_ USER INPUT	INITIALIZING	READING	WRITING	OUTPUT_ TO USER
Input_Parser		X				
Output_Formater						X
Activity_Monitor				X		
Bus_Interface			X	X	X	
Monitor_Executive	X		X			

Table 2 Monitor Application State / CSC Table

For information on data flow between the CSCs while operation in the given states see figure 3.

3.1.3 Memory and Processing Time Allocation

Not Applicable.

3.2 CSCI Design Description

The following diagrams detail the preliminary design of the CSCs identified in figure 3.

3.2.1 Input_Parser

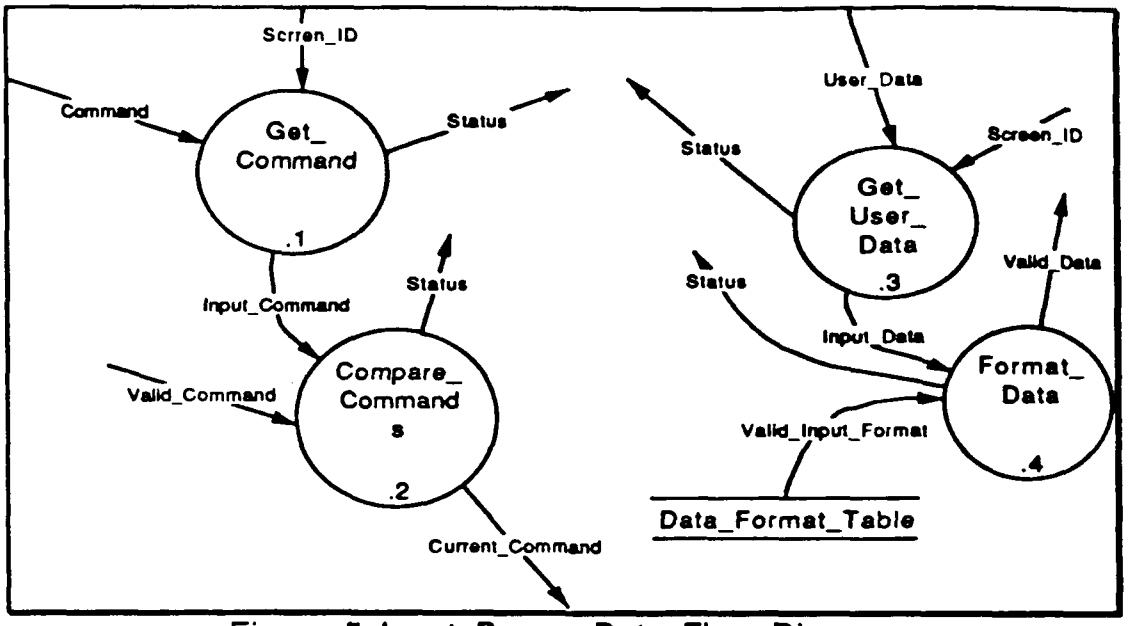


Figure 5 Input_Parser Data Flow Diagram

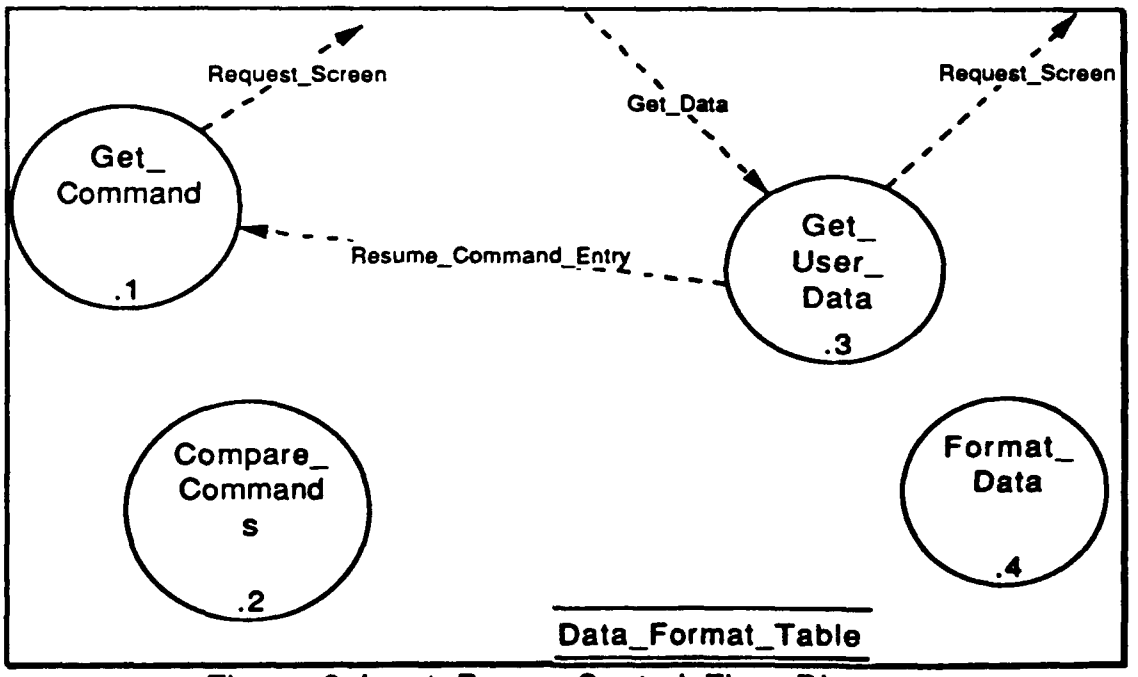


Figure 6 Input_Parser Control Flow Diagram

The input parser CSC meets the requirements identified as the user command interface in the SRS for the Generic Avionics Data Bus Tool Kit. These requirements are identified specifically in figure #2 and paragraph 3.8.1.

3.2.2 Output_Formatter

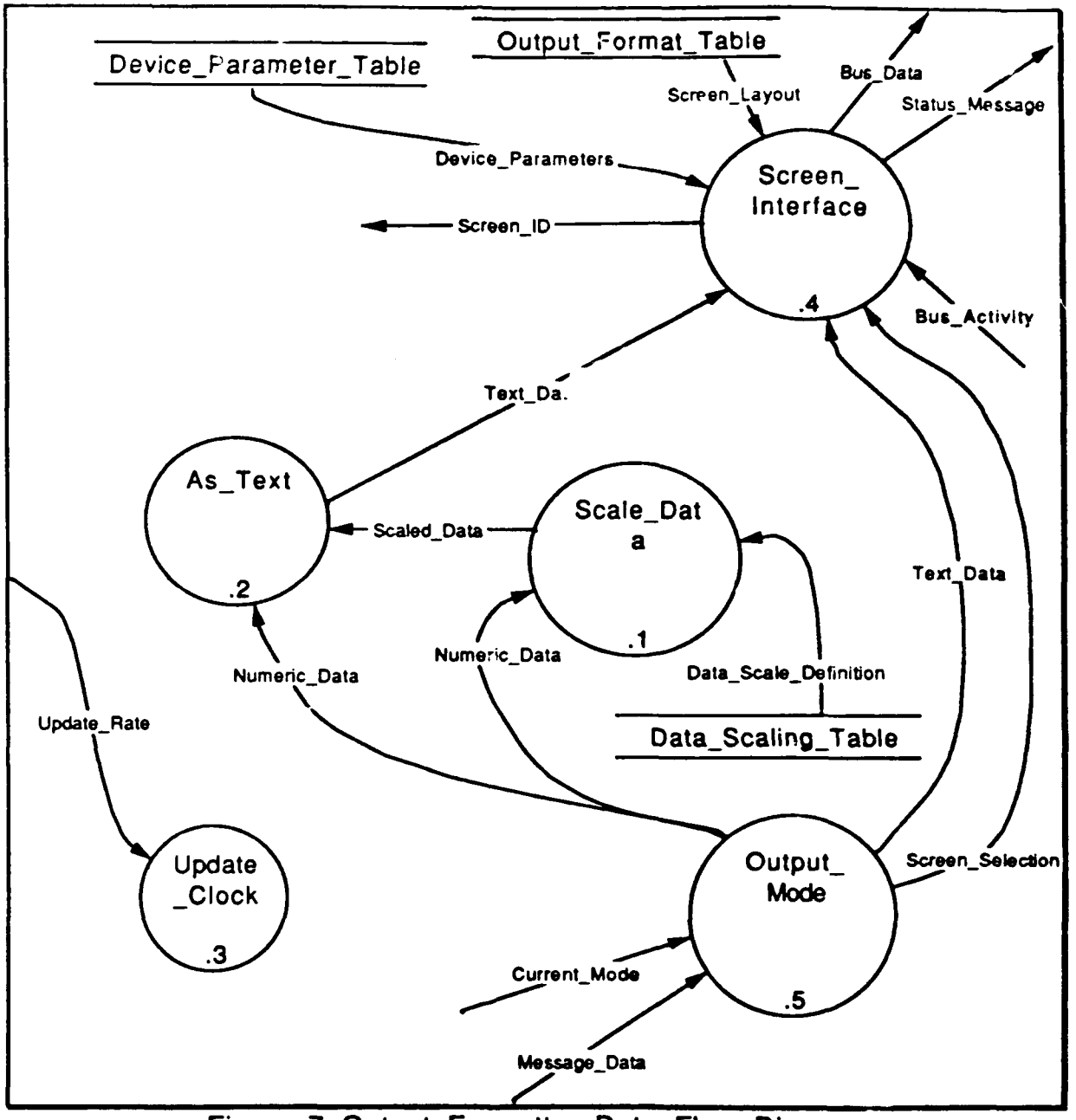


Figure 7 Output_Formatter Data Flow Diagram

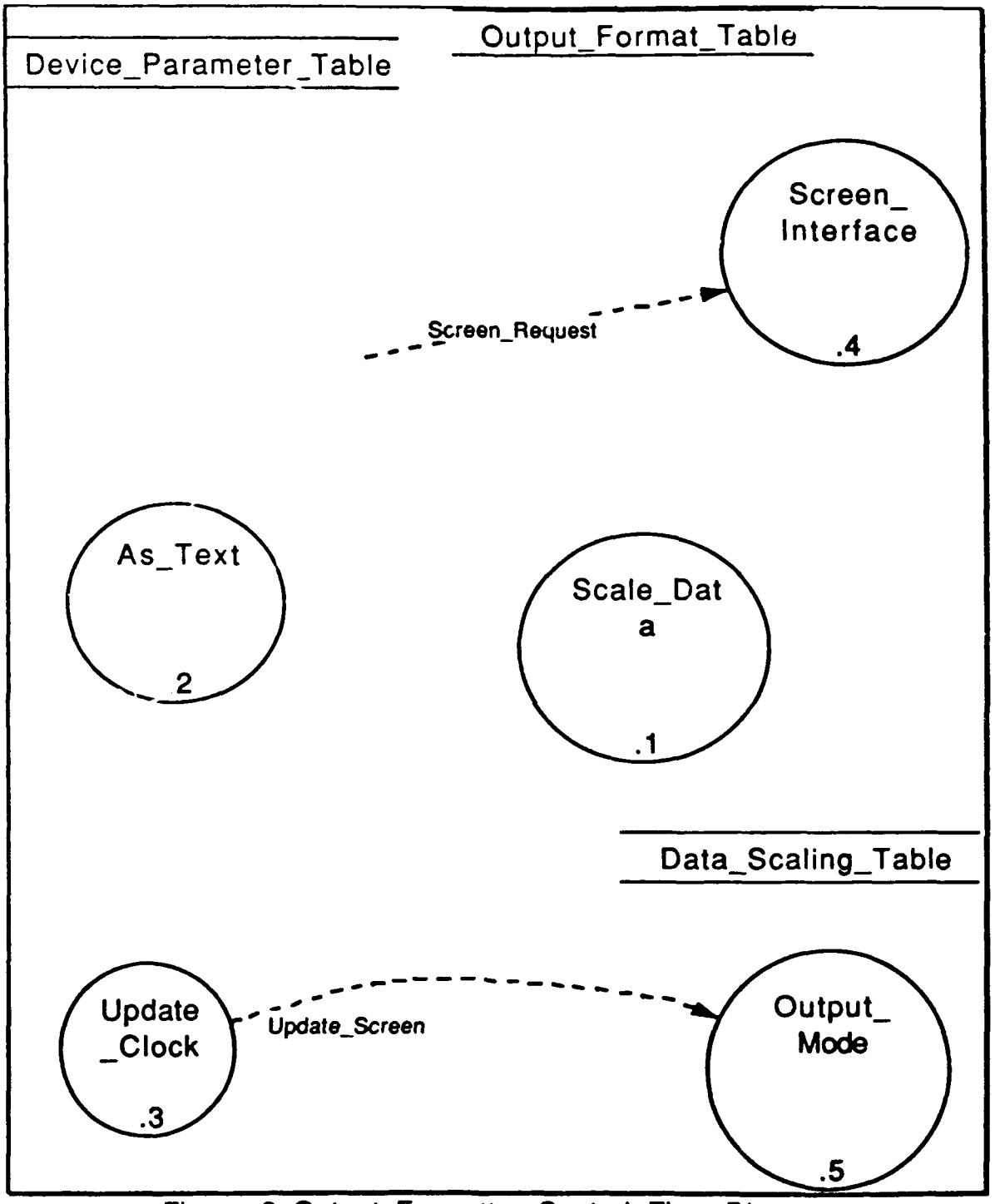


Figure 8 Output_Formatter Control Flow Diagram

The Output Formatter meets the requirements for the user output interface identified in figure #2 and paragraphs 3.2.2.2 and 3.8.4 of the SRS for the Generic Avionics Data Bus Tool Kit.

3.2.3 Activity_Monitor

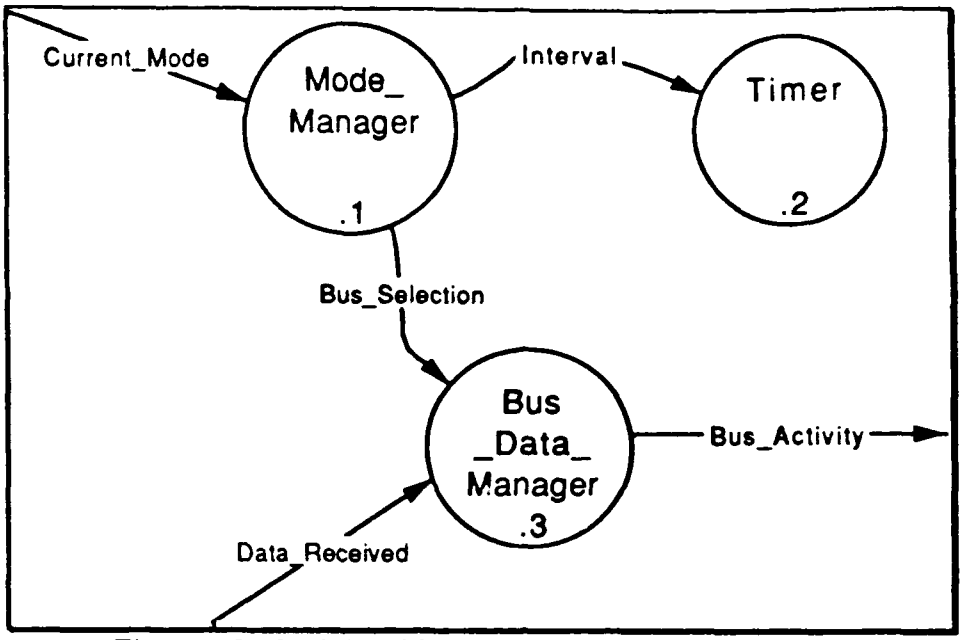


Figure 9 Activity_Monitor Data Flow Diagram

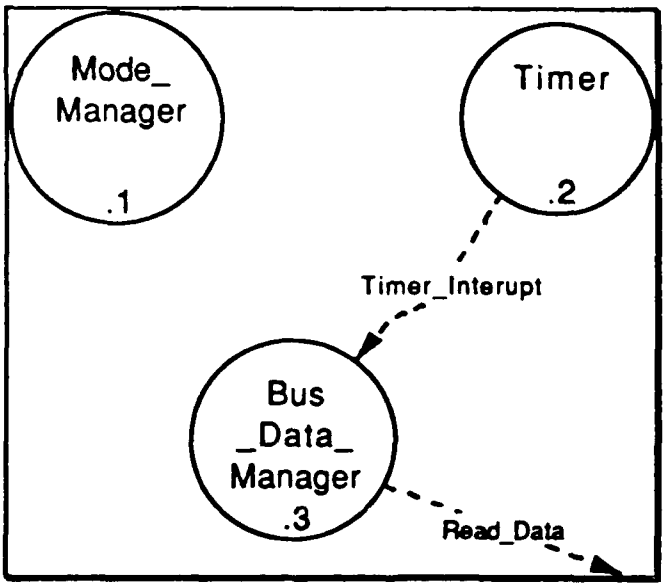


Figure 10 Activity_Monitor Control Flow Diagram

The Activity Monitor will partially fulfil the requirements of paragraph 3.2.2.2 of the SRS for the Generic Avionics Data Bus Tool Kit.

3.2.4 Bus_Interface

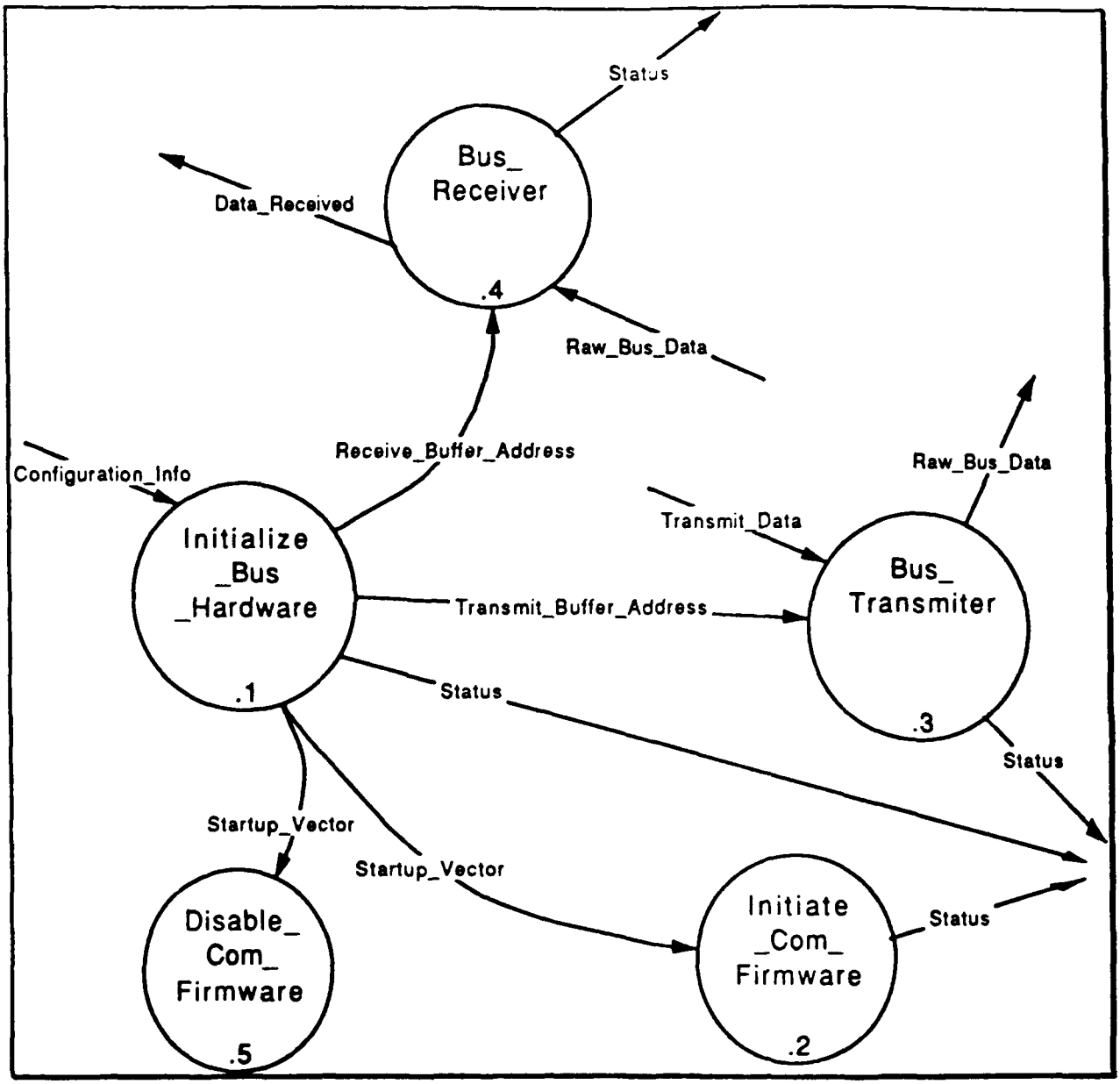


Figure 11 Bus_Interface Data Flow Diagram

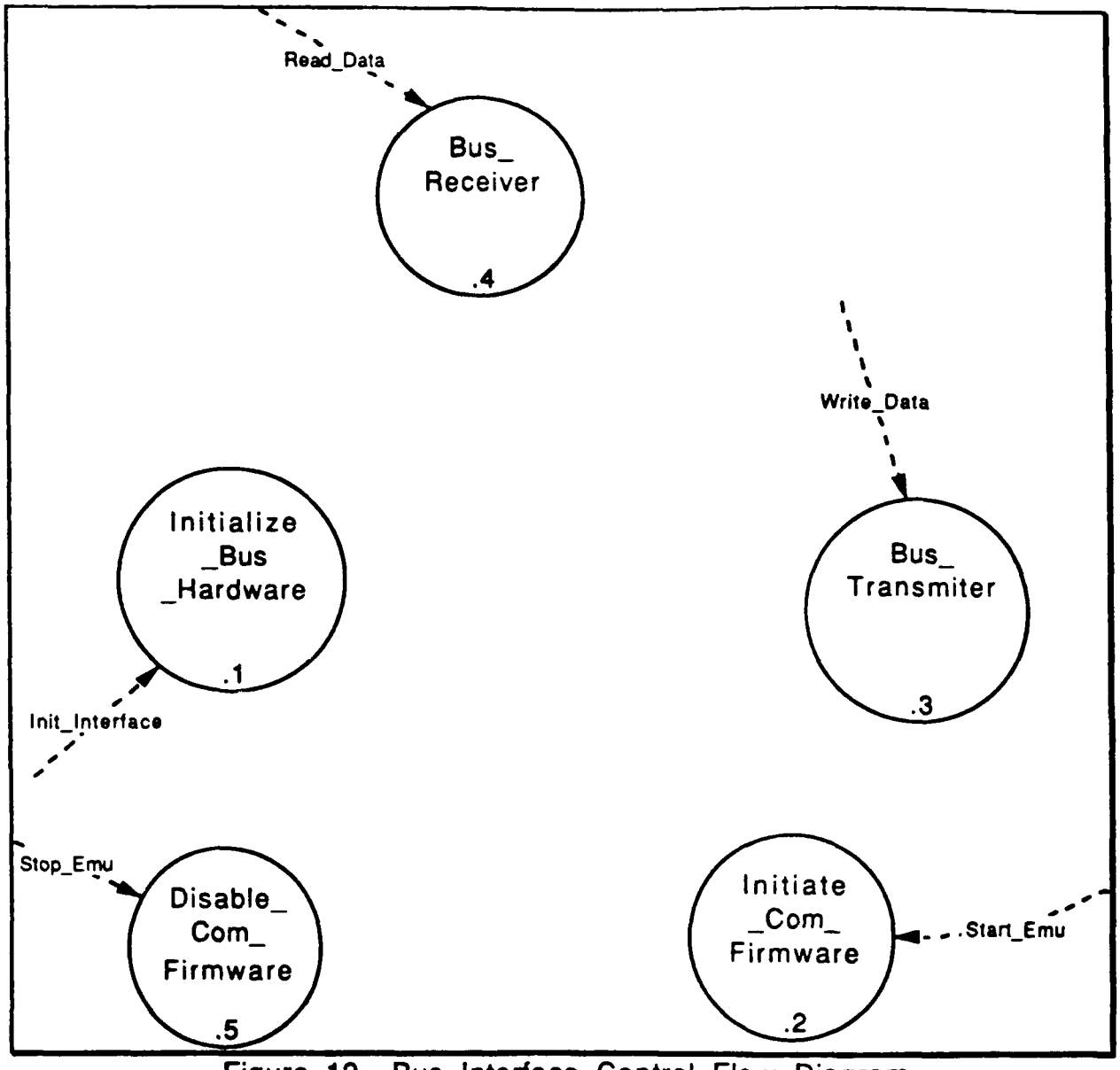


Figure 12 Bus_Interface Control Flow Diagram

The Bus Interface fulfills the requirements identified in 3.2.1 and the associated subparagraphs of the SRS for the Generic Avionics Data Bus Tool Kit.

3.2.5 Monitor_Executive

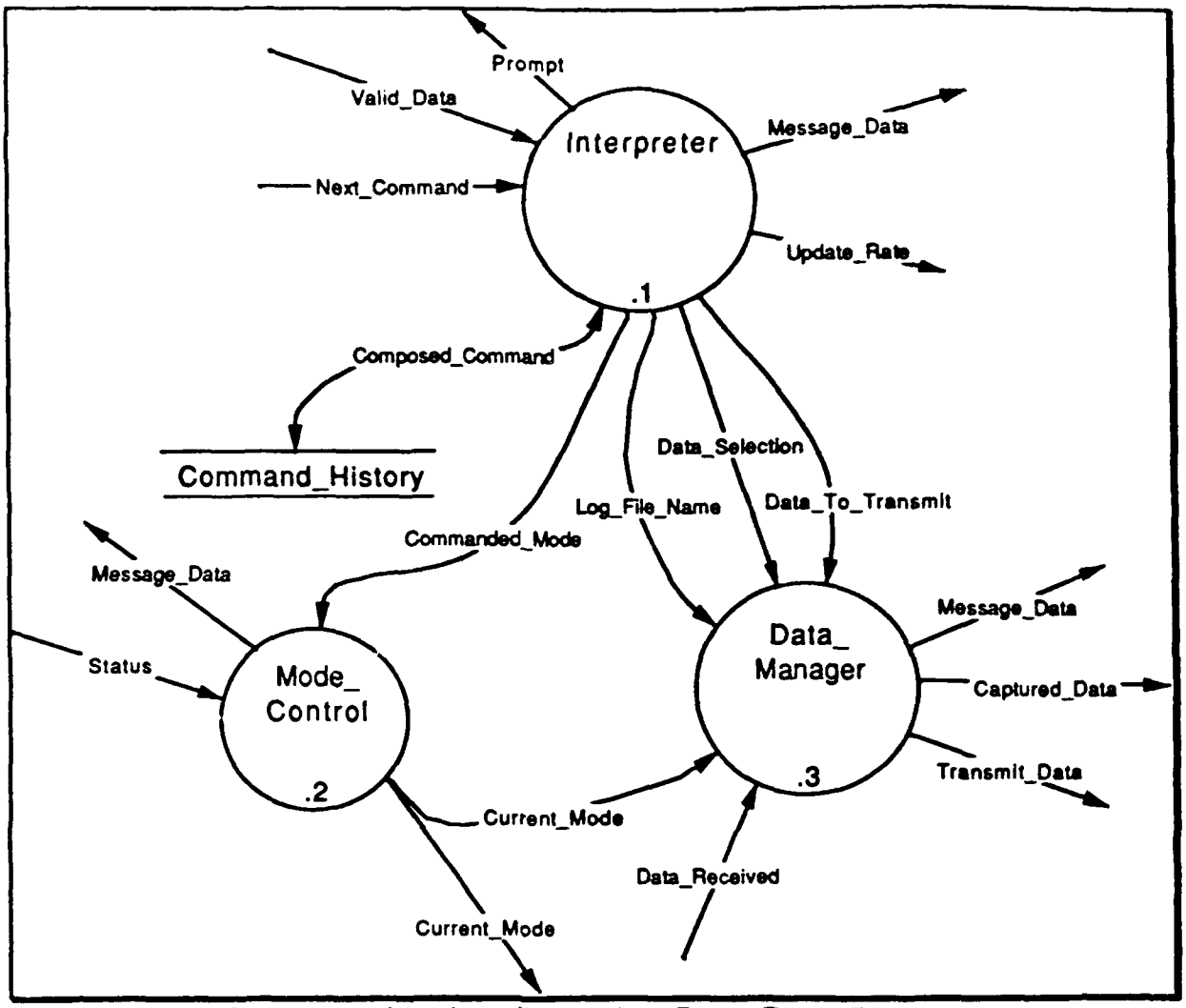


Figure 13 Monitor_Executive Data Flow Diagram

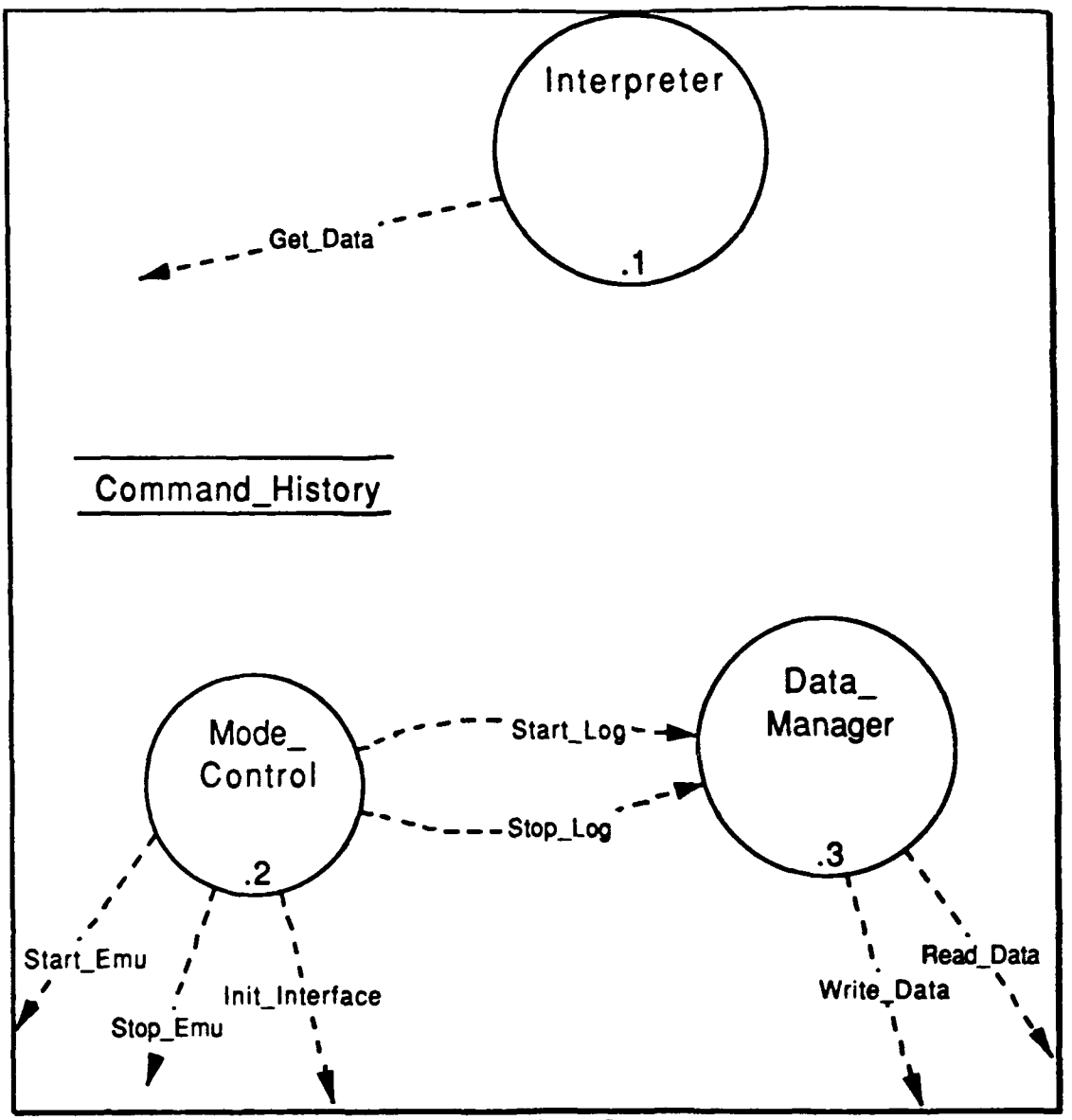


Figure 14 Monitor_Executive Control Flow Diagram

The Monitor Executive meets the requirements derived from paragraph 3.2.2 of the SRS for the Generic Avionics Data Bus Tool Kit. The Monitor Executive is not a direct requirement of the referenced document. Its requirement was derived from the need to coordinate the transfer of data and control information between the other CSC units.

4 DETAILED DESIGN

The following paragraphs present the detailed design of the CSCI identified as the Generic Avionics Data Bus Tool Kit. The format followed will be to present the Ada entity diagrams for each CSC then any Ada entity diagrams necessary for each CSU finally the Ada specification for the unit and a textual description will be presented. For more Ada structure charts see appendix B.

4.1 DD CSC Input Parser

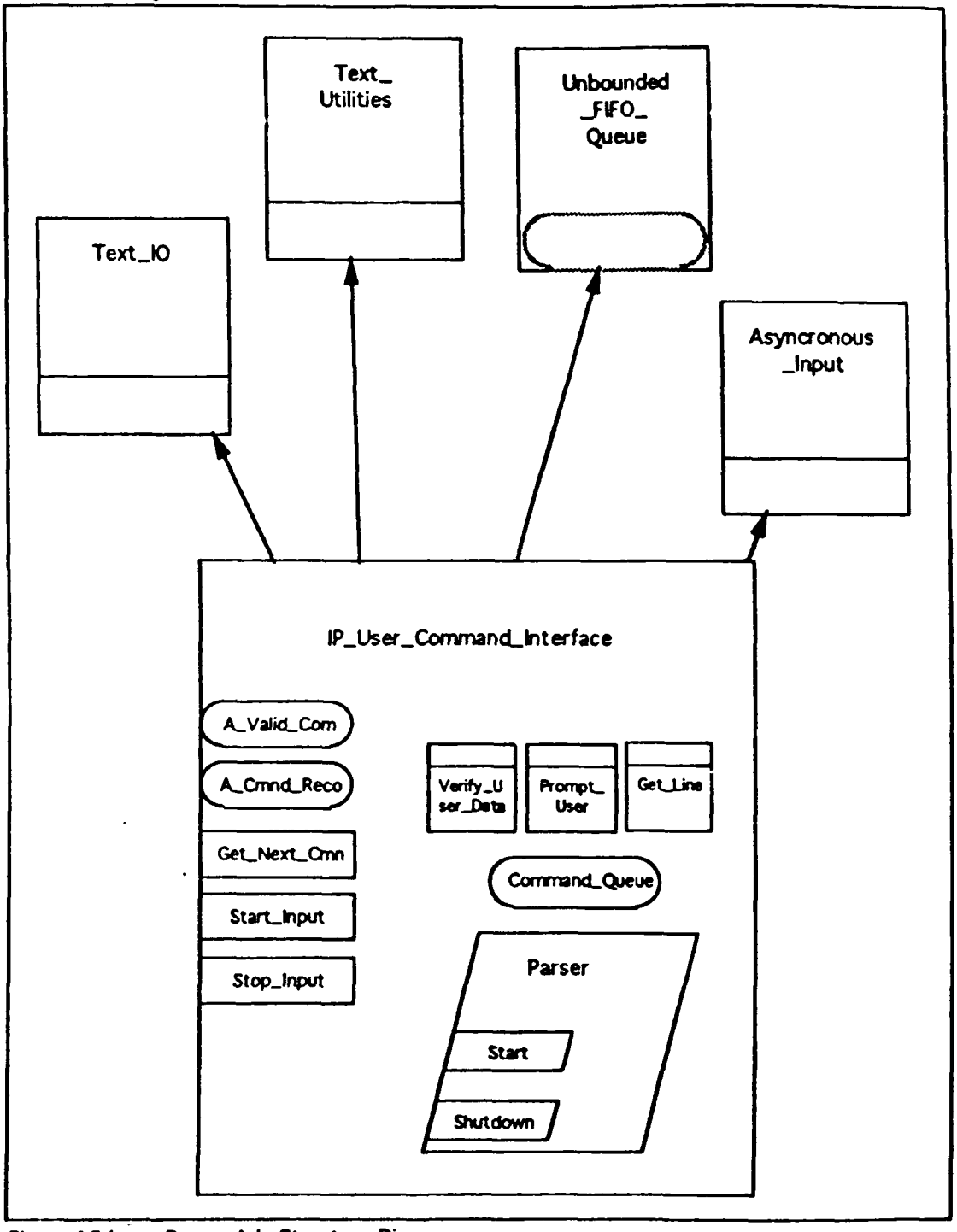


Figure 15 Input Parser Ada Structure Diagram

```
package IP_USER_COMMAND_INTERFACE is

  type A_VALID_COMMAND is ( SELECT_RT,     SELECT_SA,     SELECT_TRANS,          SELECT_RCV,
                            SELECT_BUS,    MODE_HEX,      MODE_DECIMAL,
                            MODE_BINARY,   MODE_OCTAL,    MODE_FORMATTED,
                            MODE_ACTIVITY, MODE_STATUS,   MODE_PREFERRED_DATA,
                            MODE_LOGGING,  MODE_RAW_DATA, START_LOGGING,         STOP_LOGGING,
                            SET_LOG_NAME,  SET_SNAP_LEN,  CANCEL_SELECTION,
                            RESET_DISP,    EXECUTE,       QUIT,                  NONE);

  subtype A_COMMAND_DATA is string (1..80);

  type A_VALID_COMMAND_RECORD is
  record
      Command       :A_VALID_COMMAND;
      Command_Data  :A_COMMAND_DATA;
      Data_Lenght   :INTEGER;
  end record;

  procedure Start_Input;

  procedure Get_Next_Command (COMMAND: out A_VALID_COMMAND_RECORD);

  procedure Shutdown_Input;

end IP_USER_COMMAND_INTERFACE;
```

4.1.1 IP_User_Command_Interface.Start_Input

This control interface socket is used to start the input parser processor. All local data to the package body is initialized and asyncronous input is enabled.

4.1.1.1 Start_Input Design Specification Constraints.

The input parser depends on the output formatter so if the output formatter is not running when this call is made then input processing will block until the output formatter is started.

4.1.1.2 Start_Input Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Parser entry Start_Parser : declared in local package body.

4.1.2 IP_User_Command_Interface.Shutdown_Input

This procedure will allow the task Parser to end in an orderly manner.

4.1.2.1 Shutdown_Input Design Specification Constraints.

n.a.

4.1.2.2 Shutdown_Input Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: TASKING_ERROR : If tasking error is raised a diagnostic message is directed to the output screen. The error is not propagated since it most likely is raised if the Parser task has already exited.

g. Used Elements: Task Parser entry Kill_Parser : declared in local package body.

4.1.3 IP_User_Command_Interface.Get_Next_Command

This procedure returns the next command the parser has read from the user.

4.1.3.1 Get_Next_Command Design Specification Constraints.

n.a.

4.1.3.2 Get_Next_Command Design

a. Inputs: n.a.

b. Outputs: Command : A_VALID_COMMAND_RECORD

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: If que empty return null command else return command.

f. Error Handling: none.

g. Used Elements: Function Que_Empty : declared in Command_Ques.
Function Next_Entry : declared in Command_Ques.

4.2 DD CSC Output_Formatter

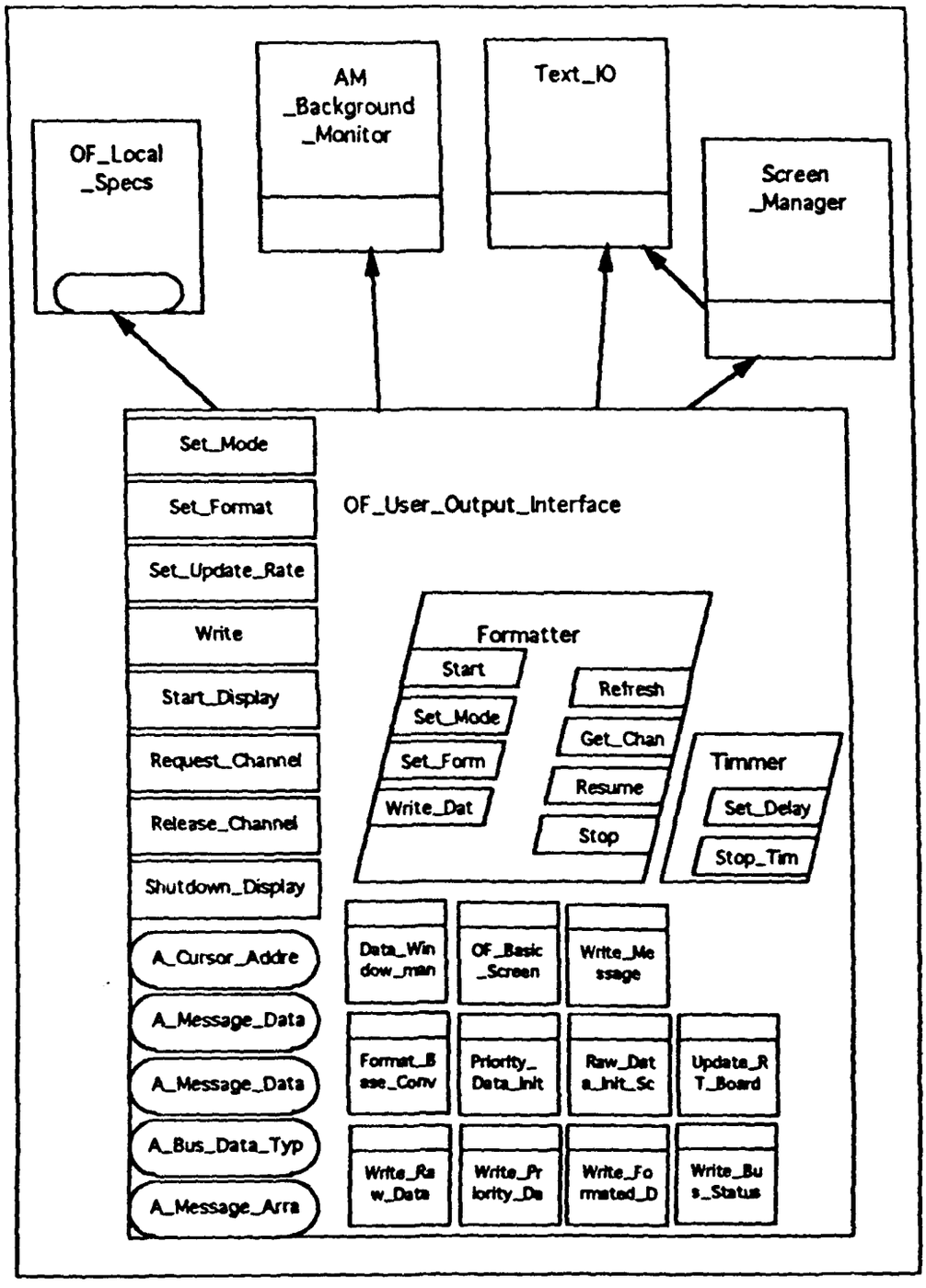


Figure 16 Output Formatter Ada Structure Diagram

```
with TD_MODE_DEFINITIONS;          use TD_MODE_DEFINITIONS;
with BI_1553_WORD_DEFINITIONS;     use BI_1553_WORD_DEFINITIONS;
with TD_TIME_TYPES;                use TD_TIME_TYPES;
with UT_VARIABLE_STRING;           use UT_VARIABLE_STRING;

package OF_USER_OUTPUT_INTERFACE is

  subtype MESSAGE_TEXT_TYPE is TEXT_TYPE(512);
  subtype ERROR_TEXT_TYPE is TEXT_TYPE(80);

  type A_MESSAGE_ARRAY is array (A_WORD_COUNT) of A_DATA_WORD;

  type BUS_DATA_TYPE is
    record
       COMMAND     : A_DATA_COMMAND_WORD;
       BUS_NUMBER  : INTEGER;
       UNIT_NUMBER : INTEGER;
       RESPONSE    : A_STATUS_WORD;
       BUS_DATA    : A_MESSAGE_ARRAY;
       ACTIVE      : BOOLEAN;
    end record;

  type A_DATA_MESSAGE_TYPE is (TEXT, BUS_DATA, ERROR);

  type A_MESSAGE_DATA_BLOCK (MESSAGE_TYPE : A_DATA_MESSAGE_TYPE) is
    record
      case MESSAGE_TYPE is
        when TEXT =>
           MESSAGE : MESSAGE_TEXT_TYPE;
        when ERROR =>
           ERROR_DATA : ERROR_TEXT_TYPE;
        when BUS_DATA =>
           BUS_DATA : BUS_DATA_TYPE;
      end case;
    end record;

  type A_CURSOR_ADDRESS is
    record
       Column : POSITIVE;
       Line   : POSITIVE;
    end record;
```

```
   procedure Set_Mode (Monitor_Mode : in A_MONITOR_MODE);

   procedure Set_Format (Format_Mode : in A_FORMAT_MODE);

   procedure Set_Update_Rate (Update_Interval : in SECONDS);

   procedure Write (Message : in A_MESSAGE_DATA_BLOCK);

   procedure Request_Channel(Cursor : out A_CURSOR_ADDRESS);

   procedure Release_Channel;

   procedure Clear_Display;

   procedure Start_Display;

   procedure Shutdown_Display;

end OF_USER_OUTPUT_INTERFACE;
```

4.2.1 OF_User_Output_Interface.Set_Mode

Place the output formatter in the specified operational mode.

4.2.1.1 Set_Mode Design Specification Constraints.

n.a.

4.2.1.2 Set_Mode Design

a. Inputs: Monitor_Mode : A_MONITOR_MODE

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

c. Local Data: Rate_Change : BOOLEAN

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Timer entry Set_Delay : declared in local package body.

4.2.4 OF_User_Output_Interface.Write

This procedure causes the data passed through the interface to be displayed on the data portion of the output screen.

4.2.4.1 Write Design Specification Constraints.

If the time needed to display the data written is greater than the time till the next all to this procedure there is no guarantee that the data will be displayed before the new data is displayed.

4.2.4.2 Write Design

a. Inputs: Message : A_MESSAGE_DATA_BLOCK

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Formatter entry Write_Data : declared in local package body.

4.2.5 OF_User_Output_Interface.Request_Channel

When this procedure is called output processing is stopped and the coordinates of the input buffer area of the screen are returned to the caller. Output remains suspended until the

f. Error Handling: none.

g. Used Elements: Task Formatter entry Set_Mode : declared in local package body.

4.2.2 OF_User_Output_Interface.Set_Format

Define the data format the output will be displayed in by the output formatter task.

4.2.2.1 Set_Format Design Specification Constraints.

n.a.

4.2.2.2 Set_Format Design

a. Inputs: Format_Mode : A_FORMAT_MODE

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Formatter entry Set_Format : declared in local package body.

4.2.3 OF_User_Output_Interface.Set_Update_Rate

This interface allows the rate for update of the RT status map portion of the display to be set.

4.2.3.1 Set_Update_Rate Design Specification Constraints.

Default rate will be set at 3 seconds.

4.2.3.2 Set_Update_Rate Design

a. Inputs: Update_Interval : SECONDS

b. Outputs: n.a.

Release_Channel interface is called.

4.2.5.1 Request_Channel Design Specification Constraints.

n.a.

4.2.5.2 Request_Channel Design

a. Inputs: n.a.

b. Outputs: Cursor : A_CURSOR_ADDRESS

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Formatter entry Get_Channel : declared in local package body.

4.2.6 OF_User_Output_Interface.Release_Channel

This procedure causes the display processor to resume screen output after a call to Request_Channel has suspended output.

4.2.6.1 Release_Channel Design Specification Constraints.

n.a.

4.2.6.2 Release_Channel Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Formatter entry Resume : declared in local package body.

4.2.7 OF_User_Output_Interface.Clear_Display

This procedure forces the display processor to reinitialize the display. This means the display is cleared and the background for the current mode and format are repainted. Display of data will resume the next time new data is written to the formatter.

4.2.7.1 Clear_Display Design Specification Constraints.

The data on the display at the time the call is made will not be redisplayed unless the same data is placed in a subsequent write operation.

4.2.7.2 Clear_Display Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Formatter entry Initialize_Display : declared in local package body.

4.2.8 OF_User_Output_Interface.Start_Display

This procedure enables screen output from the display processor.

4.2.8.1 Start_Display Design Specification Constraints.

n.a.

4.2.8.2 Start_Display Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: Start Background_Monitor
Enable Display_Processor output

f. Error Handling: none.

g. Used Elements: Procedure Turn_Background_Monitor_On : declared in package AM_Background_Monitor.
Task Formatter entry Start : declared in local package body.

4.3 DD CSC Activity_Monitor

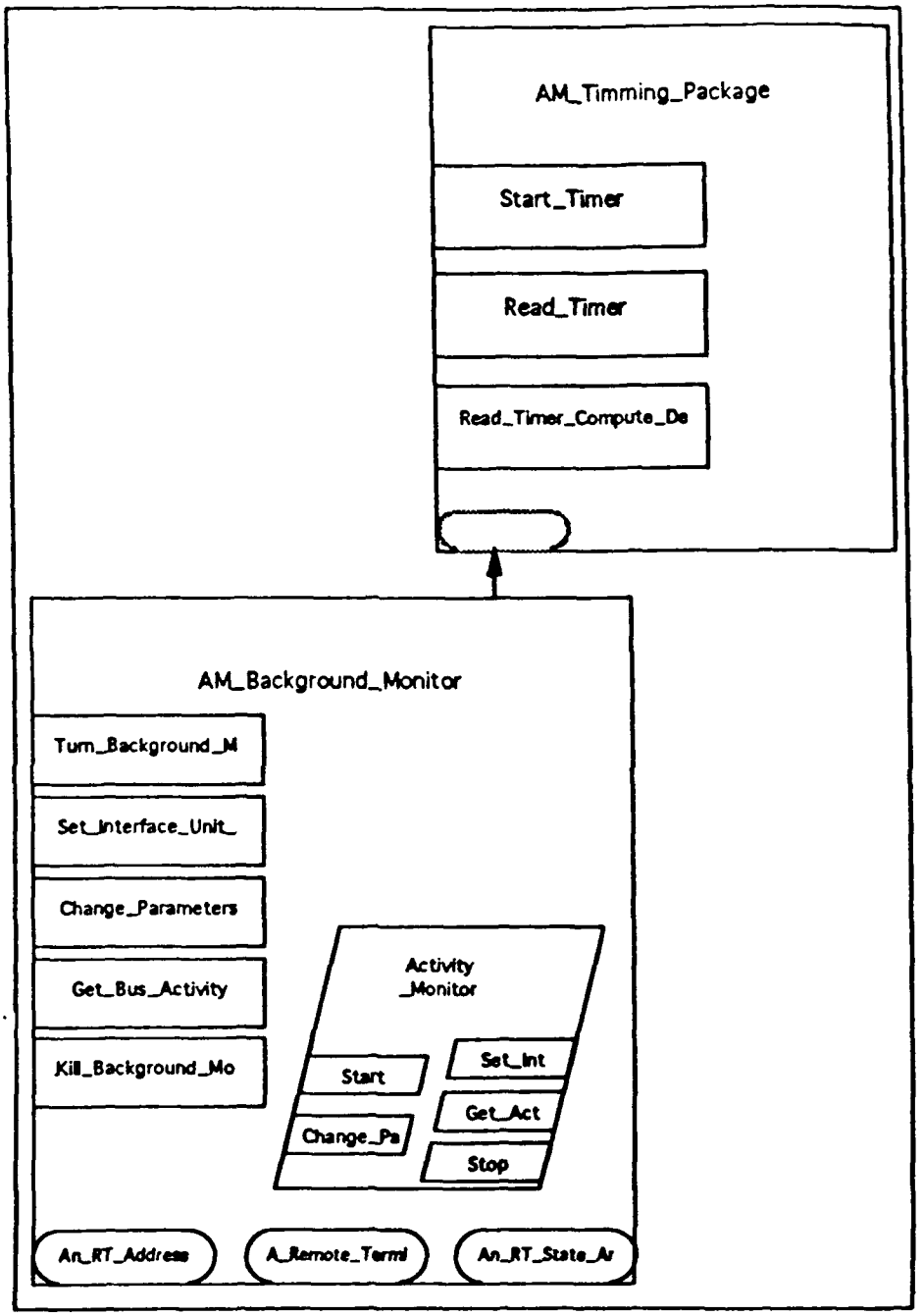


Figure 17 Avtivity Monitor Ada Structure Diagram

```
with BI_1553_WORD_DEFINITIONS;
with TD_TIME_TYPES;          use TD_TIME_TYPES;
with Interface_1553;         use Interface_1553;

package AM_BACKGROUND_MONITOR is

  package WDEF renames BI_1553_WORD_DEFINITIONS;

  subtype AN_RT_ADDRESS is WDEF.A_REMOTE_TERMINAL_ADDRESS range
                           WDEF.A_REMOTE_TERMINAL_ADDRESS'first..
                           WDEF.A_REMOTE_TERMINAL_ADDRESS'pred(
                           WDEF.A_REMOTE_TERMINAL_ADDRESS'last);

  type A_REMOTE_TERMINAL_STATE is (ACTIVE_NOW, -- RT responding.
                                   ACTIVE,     -- RT was active, but ceased.
                                   MC_ONLY,    -- MC commanding, no response.
                                   INACTIVE);  -- No activity observed.

  type AN_RT_STATE_ARRAY is array (AN_RT_ADDRESS) of A_REMOTE_TERMINAL_STATE;

  procedure Turn_Background_Monitor_ON (History_Length : in SECONDS := 120;
                                        Sample_Rate    : in SAMPLES_PER_SECOND := 10);

  procedure Set_Interface_Unit_Number (Unit_Number : in A_Interface_Unit);

  procedure Turn_Background_Monitor_OFF;

  procedure Change_BM_Parameters (History_Length :  in SECONDS := 120;
                                  Sample_Rate    :  in SAMPLES_PER_SECOND := 10);

  procedure Get_Bus_Activity (Activity_Record : out AN_RT_STATE_ARRAY);

  procedure Kill_Background_Monitor_Task;

end AM_BACKGROUND_MONITOR;
```

4.3.1 AM_Background_Monitor.Turn_Background_Monitor_On

This procedure will initialize the timers and starts the task to keep the RT activity Map data.

4.3.1.1 Turn_Background_Monitor_On Design Specification Constraints.

n.a.

4.3.1.2 Turn_Background_Monitor_On Design

a. Inputs: History_Length : SECONDS
Sample_Rate : SAMPLES_PER_SECOND

b. Outputs: n.a.

c. Local Data: Past_Duration : SECONDS
The_Sample_Rate : SAMPLES_PER_SECOND

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Activity_Monitor entry Turn_On : declared in local package body.

4.3.2 AM_Background_Monitor.Set_Interface_Unit_Number

This procedure selects the CTSD MMBI interface unit that will be monitored.

4.3.2.1 Set_Interface_Unit_Number Design Specification Constraints.

n.a.

4.3.2.2 Set_Interface_Unit_Number Design

a. Inputs: Unit_Number : A_UNIT_NUMBER

b. Outputs: n.a.

c. Local Data: The_1553_Interface_Unit : A_UNIT_NUMBER

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: n.a.

4.3.3 AM_Background_Monitor.Change_BM_Parameters

This procedure allows the operational parameters to be modified dynamically during execution.

4.3.3.1 Change_BM_Parameters Design Specification Constraints.

n.a.

4.3.3.2 Change_BM_Parameters Design

a. Inputs: History_Length : SECONDS
Sample_Rate : SAMPLES_PER_SECOND

b. Outputs: n.a.

c. Local Data: Past_Duration : SECONDS
The_Sample_Rate : SAMPLES_PER_SECOND

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Activity_Monitor entry Change_Settings : declared in local package body.

4.3.4 AM_Background_Monitor.Get_Bus_Activity

Interface to take a snapshot of the current Bus Activity Map.

4.3.4.1 Get_Bus_Activity Design Specification Constraints.

n.a.

4.3.4.2 Get_Bus_Activity Design

a. Inputs: n.a.

b. Outputs: Activity_Record : AN_RT_STATE_ARRAY

c. Local Data: Current_RT_State_Table : AN_RT_STATE_ARRAY

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Activity_Monitor entry Report_Activity : declared in local package body.

4.3.5 AM_Background_Monitor.Turn_Background_Monitor_Off

Suspend background monitor.

4.3.5.1 Turn_Background_Monitor_Off Design Specification Constraints.

n.a.

4.3.5.2 Turn_Background_Monitor_Off Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Activity_Monitor entry Turn_Off : declared in local package body.

4.3.6 AM_Background_Monitor.Kill_Background_Monitor_Task

4.3.6.1 Kill_Background_Monitor_Task Design Specification Constraints.

4.3.6.2 Kill_Background_Monitor_Task Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Task Activity_Monitor entry Kill : declared in local package body.

4.4 DD CSC Bus_Interface

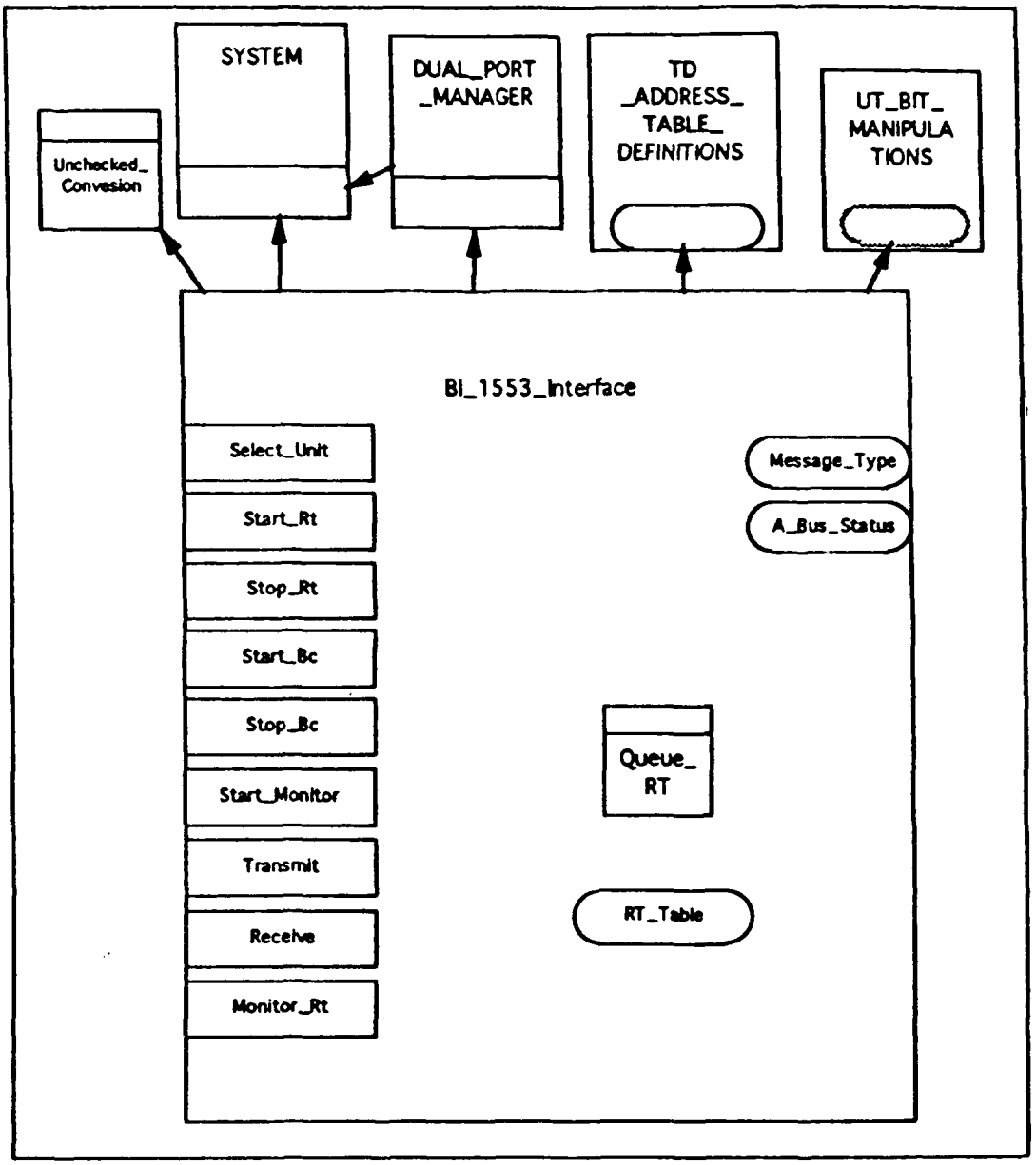


Figure 18 Bus Interface Ada Structure Diagram

```
with BI_1553_WORD_DEFINITIONS;        use BI_1553_WORD_DEFINITIONS;

package BI_1553_INTERFACE is

  BUS_DATA_FORMAT_ERROR      : exception;
  HARDWARE_FAILURE           : exception;
  KERNAL_SYSTEM_ERROR        : exception;
  RANGE_ERROR                : exception;

  type MESSAGE_TYPE is (COMMAND,RESPONCE);
  type A_BUS_STATUS is (INITIALIZED, NOT_REINITIALIZED,
                        NOT_INITIALIZED, OUT_OF_MEMORY,
                        PARAMETER_ERROR);

  subtype AN_INTERFACE is INTEGER range 0..3;
  subtype A_MFS_BUS is INTEGER range 0..7;
  subtype A_UNIBUS is INTEGER range 0..2;

  subtype A_TIME_TAG is INTEGER range INTEGER'first..INTEGER'last;

  procedure Select_Unit (Interface_Number : AN_INTERFACE := 0;
                         Bus_Number       : A_MFS_BUS    := 0;
                         Unibus_Number    : A_UNIBUS     := 0);

  procedure Start_RT (Remote_Terminal : in     A_REMOTE_TERMINAL_ADDRESS;
                      Status          :    out A_BUS_STATUS);

  procedure Stop_RT (Remote_Terminal : in     A_REMOTE_TERMINAL_ADDRESS);

  procedure Start_BC (Status :    out A_BUS_STATUS);

  procedure Stop_BC;

  procedure Start_Monitor (Remote_Terminal : in     A_REMOTE_TERMINAL_ADDRESS;
                           Status          :    out A_BUS_STATUS);

  procedure Stop_Monitor (Remote_Terminal : in     A_REMOTE_TERMINAL_ADDRESS);

  generic
    type A_TRANSMIT_MESSAGE_BUFFER is limited private;
    type A_BUS_OVERHEAD_WORD is limited private;
```

```
procedure Transmit (Data     : in A_TRANSMIT_MESSAGE_BUFFER;
                    Bus_Word : in A_BUS_OVERHEAD_WORD;
                    Form     : in MESSAGE_TYPE;
                    Subaddress : in A_SUBADDRESS := 0);

generic
  type A_RECEIVE_MESSAGE_BUFFER is private;
  type A_BUS_OVERHEAD_WORD is private;
procedure Receive (Data       :    out A_RECEIVE_MESSAGE_BUFFER;
                   Bus_Word   :    out A_BUS_OVERHEAD_WORD;
                   Time       :    out A_TIME_TAG;
                   Form       : in     MESSAGE_TYPE;
                   RT_Number  : in     A_REMOTE_TERMINAL_ADDRESS;
                   Subaddress : in     A_SUBADDRESS);

generic
  type A_MONITOR_MESSAGE_BUFFER is private;
procedure Monitor_RT (Command_Word :    out A_DATA_COMMAND_WORD;
                      Data         :    out A_MONITOR_MESSAGE_BUFFER;
                      Status_Word  :    out A_STATUS_WORD;
                      Time         :    out A_TIME_TAG;
                      Form         : in     MESSAGE_TYPE;
                      RT_Number    : in     A_REMOTE_TERMINAL_ADDRESS;
                      Subaddress   : in     A_SUBADDRESS);

end BI_1553_INTERFACE;
```

4.4.1 BI_1553_Interface.Select_Unit

This procedure is used in an environment where multiple 1553 hardware interfaces exist in parallel to select the specific unit to operate on. The bus to default to is also selected with this procedure. Additionally for use on the CTSD MMBI interface adaptor the VAX Unibus number is needed to uniquely identify the unit.

4.4.1.1 Select_Unit Design Specification Constraints.

n.a.

4.4.1.2 Select_Unit Design

a. Inputs: Interface_Number : AN_INTERFACE
Bus_Number : A_MFS_BUS

Unibus_Number : A_UNIBUS

b. Outputs: n.a.

c. Local Data: Interface : A_INTERFACE_UNIT
RT_Table : AN_INTERFACE_TABLE

d. Signals: n.a.

e. Algorithms: if input parameters are in valid range assign to local copies else raise RANGE_ERROR.

f. Error Handling: none.

g. Used Elements: n.a.

4.4.2 BI_1553_INTERFACE.Start_RT

This procedure allocates memory, will initialize data structures, and activates the interface hardware for the specified RT.

4.4.2.1 Start_RT Design Specification Constraints.

n.a.

4.4.2.2 Start_RT Design

a. Inputs: Remote_Terminal : A_REMOTE_TERMINAL_ADDRESS

b. Outputs: Status : A_BUS_STATUS

c. Local Data: RT : A_REMOTE_TERMINAL_ADDRESS
Stat : A_BUS_STATUS
DP_Unibus_Address : NATURAL
Data_Block_Size : INTEGER

d. Signals: n.a.

e. Algorithms: Verify interface usability.

Create a data pointer offset table.
Allocate memory.
Initialize memory.
Start 1553 processor.

f. Error Handling: none.

g. Used Elements: Procedure Verify_Interface : declared in local package body.
Procedure Create_Offset_Table : declared in local package body.
Procedure Allocate_Buffers : declared in local package body.
Procedure Queue_RT : declared in local package body.

4.4.3 BI_1553_INTERFACE.Stop_RT

This procedure is used to halt the interface processor and release allocated memory.

4.4.3.1 Stop_RT Design Specification Constraints.

n.a.

4.4.3.2 Stop_RT Design

a. Inputs: Remote_Terminal : A_REMOTE_TERMINAL_ADDRESS

b. Outputs: n.a.

c. Local Data: Tbus_Address : A_TBUS_ADDRESS
Tbus_Status : A_TBUS_STATUS
RT_Offset : A_TBUS_ADDRESS

d. Signals: n.a.

e. Algorithms: Calculate the control register address for the interface.
Write halt code to control register.
Release allocated memory blocks.

f. Error Handling: none.

g. Used Elements: Procedure Write_Tbus : declared in package Interface_1553.
Procedure Release : declared in package Dual_Port_Manager.

4.4.4 BI_1553_INTERFACE.Start_BC

This procedure is used to allocate memory, initialize data structures and start the interface processor in Bus Controller mode.

4.4.4.1 Start_BC Design Specification Constraints.

n.a.

4.4.4.2 Start_BC Design

a. Inputs: n.a.

b. Outputs: Status : A_BUS_STATUS

c. Local Data: BC_Data_Block : A_BUS_CONTROLER_DESCRIPTOR
Tbus_Address : A_TBUS_ADDRESS
Tbus_Status : A_TBUS_ERROR

d. Signals: n.a.

e. Algorithms: Verify hardware accessibility.
Allocate memory.
Initialize data structures.
Calculate control register address.
Write enable to control register.

f. Error Handling: none.

g. Used Elements: Procedure Read_Tbus : declared in package Interface_1553.
Procedure Write_Tbus : declared in package Interface_1553.
Procedure Allocate : declared in package Dual_Port_Manager.

4.4.5 BI_1553_INTERFACE.Stop_BC

Procedure releases memory and halts interface.

4.4.5.1 Stop_BC Design Specification Constraints.

n.a.

4.4.5.2 Stop_BC Design

a. Inputs: n.a.

b. Outputs: n.a.

c. Local Data: Tbus_Address : A_TBUS_ADDRESS
Tbus_Status : A_TBUS_STATUS
RT_Offset : A_TBUS_ADDRESS

d. Signals: n.a.

e. Algorithms: Calculate the control register address for the interface.
Write halt code to control register.
Release allocated memory blocks.

f. Error Handling: none.

g. Used Elements: Procedure Write_Tbus : declared in package Interface_1553.
Procedure Release : declared in package Dual_Port_Manager.

4.4.6 BI_1553_INTERFACE.Start_Monitor

This procedure is used to allocate memory, initialize data structures, and start monitoring all traffic associated with a particular RT.

4.4.6.1 Start_Monitor Design Specification Constraints.

n.a.

4.4.6.2 Start_Monitor Design

a. Inputs: Remote_Terminal : A_REMOTE_TERMINAL_ADDRESS

b. Outputs: Status : A_BUS_STATUS

c. Local Data: RT : A_REMOTE_TERMINAL_ADDRESS
Stat : A_BUS_STATUS
DP_Unibus_Address : NATURAL
Data_Block_Size : INTEGER

d. Signals: n.a.

e. Algorithms: Verify interface usability.
Create a data pointer offset table.
Allocate memory.
Initialize memory.
Start 1553 processor.

f. Error Handling: none.

g. Used Elements: Procedure Verify_Interface : declared in local package body.
Procedure Create_Offset_Table : declared in local package body.
Procedure Allocate_Buffers : declared in local package body.
Procedure Queue_RT : declared in local package body.

4.4.7 BI_1553_INTERFACE.Stop_Monitor

Procedure to release resources and halt interface processor allocated to monitoring operations.

4.4.7.1 Stop_Monitor Design Specification Constraints.

n.a.

4.4.7.2 Stop_Monitor Design

a. Inputs: Remote_Terminal : A_REMOTE_TERMINAL_ADDRESS

b. Outputs: n.a.

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: n.a.

f. Error Handling: none.

g. Used Elements: Procedure Stop_Rt : declared in local package specification.

4.4.8 BI_1553_INTERFACE.Transmit

This is a generic procedure to that will place the user defined data on the bus. The Generic formal parameter A_TRANSMIT_MESSAGE_BUFFER is the user defined data buffer that contains the message data words of the bus message. The A_BUS_OVERHEAD_WORD is either a command word type or a status word depending on the interface type (RT or BC). The Form parameter indicates how the Bus_Word parameter is to be interpreted. The user sets the Form parameter to Command if the currently selected interface has been configured as a BC or Response if the currently selected interface is started as an RT. The Subaddress field is used if the Form is Response to find the correct buffer to place the message into for transmission.

4.4.8.1 Transmit Design Specification Constraints.

n.a.

4.4.8.2 Transmit Design

a. Inputs: Data : A_TRANSMIT_MESSAGE_BUFFER
Bus_Word : A_BUS_OVERHEAD_WORD
Form : MESSAGE_TYPE
Subaddress : A_SUBADDRESS

b. Outputs: n.a.

c. Local Data: Command_Word : A_TRANSMIT_COMMAND
Status_Word : A_STATUS_WORD

d. Signals: Transmit_Complete : VAX ast

e. Algorithms: if Form is Command then get command word and data
else get status word and data
send message

f. Error Handling: none.

g. Used Elements: Procedure Write_Status : declared in local package body.
Procedure Copy_Block : declared in local package body.

4.4.9 BI_1553_INTERFACE.Receive

This generic procedure reads data from the bus. The generic formal parameters are analogous to the ones in the Transmit procedure. In this RT number and the subaddress must be supplied as the input parameters to filter the desired data from the bus traffic. The Time output is provided to give access to the clock on the interface at the time the data is read.

4.4.9.1 Receive Design Specification Constraints.

n.a.

4.4.9.2 Receive Design

a. Inputs: Form : MESSAGE_TYPE
RT_Number : A_REMOTE_TERMINAL_ADDRESS
Subaddress : A_SUBADDRESS

b. Outputs: Data : A_RECEIVE_MESSAGE_BUFFER
Bus_Word : A_BUS_OVERHEAD_WORD
Time : A_TIME_TAG

c. Local Data: Status_Word : A_STATUS_WORD
Base_Address : ADDRESS
WC : INTEGER
Command_Word: A_DATA_COMMAND_WORD
Time_Value : A_TIME
Status : A_INTERFACE_ERROR
Direction : A_TRANSFER_DIRECTION

d. Signals: Receive_Complete : VAX ast

e. Algorithms: If interface running then copy bus data to user variables
else signal error.

f. Error Handling: if CONSTRAINT_ERROR signal data format error.

g. Used Elements: Procedure Read_Timer : declared in Interface_1553

4.4.10 BI_1553_INTERFACE.Monitor_RT

This procedure has only one formal generic parameter. This is because both Command and Status words are returned with the data. The concept with this procedure was not to capture all the data on the bus but rather to allow the hardware to filter only the data of interest. The Form parameter in this context is to add filtering by selecting the type of transfer to record; i.e. RT to BC or BC to RT.

4.4.10.1 Monitor_RT Design Specification Constraints.

n.a.

4.4.10.2 Monitor_RT Design

a. Inputs: Form : MESSAGE_TYPE
RT_Number : A_REMOTE_TERMINAL_ADDRESS
Subaddress : A_SUBADDRESS

b. Outputs: Command_Word : A_DATA_COMMAND_WORD
Data : A_MONITOR_MESSAGE_BUFFER
Status_Word : A_STATUS_WORD
Time : A_TIME_TAG

c. Local Data: Data_Pnt : ADDRESS
Data_Word : UNSIGNED_WORD
Words : INTEGER
Command_Tmp : A_DATA_COMMAND_WORD
Direction : A_TRANSFER_DIRECTION
Time_Value : A_TIME
Status : A_INTERFACE_ERROR

d. Signals: n.a.

e. Algorithms: If interface is running get data and time stamp
else signal error.

f. Error Handling: none.

g. Used Elements: Procedure Copy_Block : declared in local package body.

4.5 DD CSC Monitor_Executive

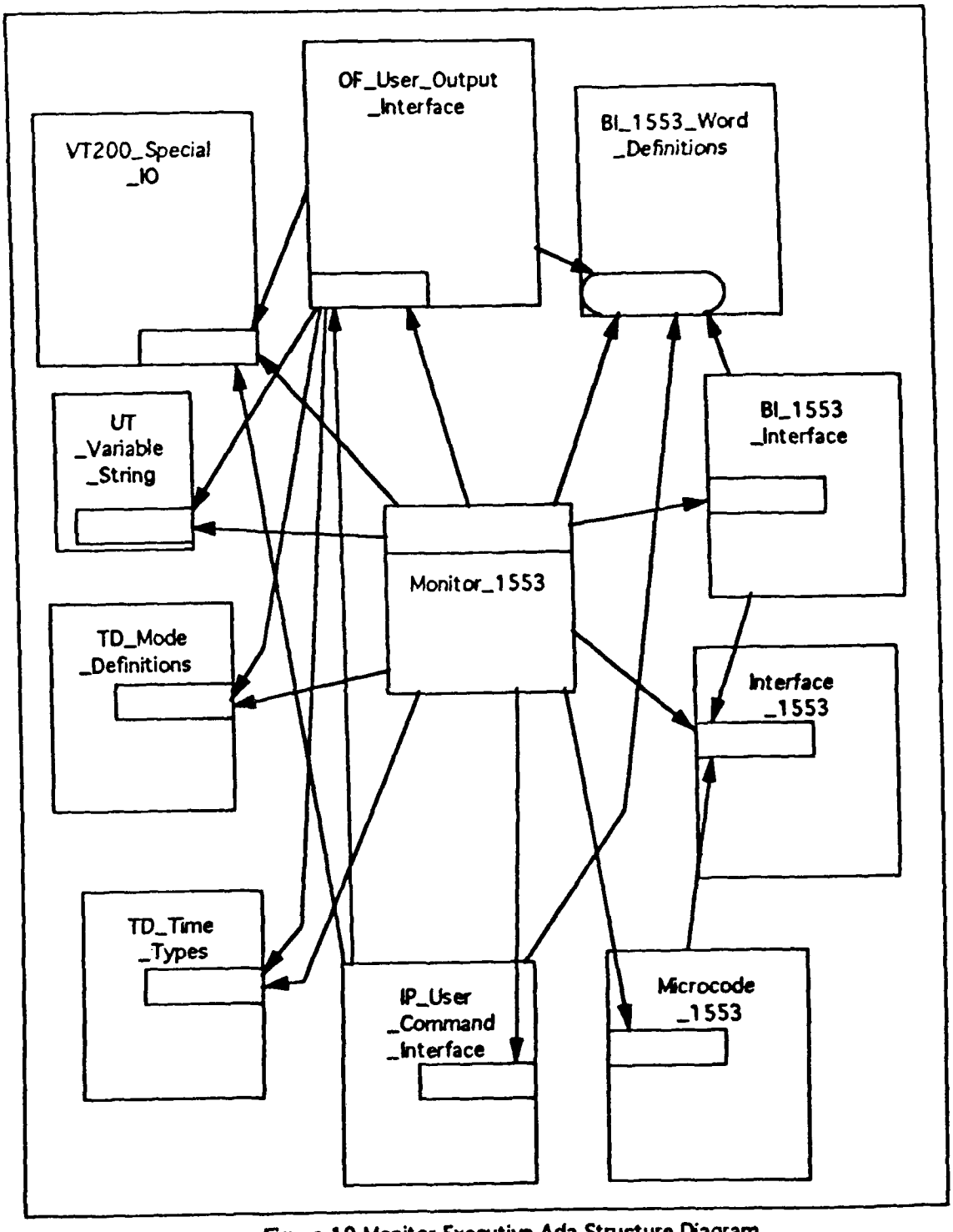


Figure 19 Monitor Executive Ada Structure Diagram

```
with VT200_SPECIAL_IO;                    use VT200_SPECIAL_IO;

with UT_VARIABLE_STRING;                  use UT_VARIABLE_STRING;
with TD_MODE_DEFINITIONS;                 use TD_MODE_DEFINITIONS;
with TD_TIME_TYPES;                       use TD_TIME_TYPES;
with INTERFACE_1553;                      use INTERFACE_1553;
with MICROCODE_1553;                      use MICROCODE_1553;
with BI_1553_WORD_DEFINITIONS;            use BI_1553_WORD_DEFINITIONS;
with BI_1553_INTERFACE;                   use BI_1553_INTERFACE;
with OF_USER_OUTPUT_INTERFACE;            use OF_USER_OUTPUT_INTERFACE;
with IP_USER_COMMAND_INTERFACE;           use IP_USER_COMMAND_INTERFACE;

procedure MONITOR_1553 is

  type AN_RT_SELECTION_TABLE is array(A_REMOTE_TERMINAL_ADDRESS) of BOOLEAN;

  type A_SELECTION_DESCRIPTOR is
    record
      RT     : A_REMOTE_TERMINAL_ADDRESS;
      SA     : A_SUBADDRESS;
      TR     : A_TRANSFER_DIRECTION;
      BN     : INTEGER;
      UN     : INTEGER;
      Active : BOOLEAN := FALSE;
    end record;

  subtype A_SELECTION_INDEX is INTEGER range 1..2;

  type A_SELECTION_ARRAY is array (A_SELECTION_INDEX) of A_SELECTION_DESCRIPTOR;

  type AN_INTERFACE_ARRAY is array (A_INTERFACE_UNIT'pos(A_INTERFACE_UNIT'first)..
                                    A_INTERFACE_UNIT'pos(A_INTERFACE_UNIT'last)) of BOOLEAN;

  MICROCODE_ERROR    : exception;

  Microcode_Filename : constant STRING := "1553$DISK:[ATIP.DEV.MICROCODE]BUSMON3.LIS";

  Monitor_RT         : AN_RT_SELECTION_TABLE := (others => FALSE);
  Interface_Loaded   : AN_INTERFACE_ARRAY := (others => FALSE);
  Current_Sel        : A_SELECTION_ARRAY;
  Next_Sel           : INTEGER := A_SELECTION_INDEX'first;
```

```
  Last_Sel            : INTEGER := A_SELECTION_INDEX'first;
  New_Sel             : A_SELECTION_DESCRIPTOR;
  Mode                : A_MONITOR_MODE := BUS_STATUS;
  Format              : A_FORMAT_MODE;
  Mode_Change         : BOOLEAN := FALSE;
  Format_Change       : BOOLEAN := FALSE;
  Exit_Loop           : BOOLEAN := FALSE;
  First_RT_Selected   : BOOLEAN := TRUE;
  Command_Rec         : A_VALID_COMMAND_RECORD;
  Information         : A_MESSAGE_DATA_BLOCK(TEXT);
  Error_Text          : A_MESSAGE_DATA_BLOCK(ERROR);
  MicroCode_ID        : A_MICROCODE_ID;
  Mic_Error           : A_MICROCODE_ERROR;

  function Get_Selection_Data (User_Data : STRING)
    return A_SELECTION_DESCRIPTOR is separate;

  procedure Rotate (Index : in out A_SELECTION_INDEX) is separate;

  procedure Initialize (Active_RT        : in out AN_RT_SELECTION_TABLE;
                        Interface_Active : in out AN_INTERFACE_ARRAY;
                        Microcode_Ident  : in     A_MICROCODE_ID;
                        New_Selection    : in     A_SELECTION_DESCRIPTOR) is separate;

  procedure Deactivate (Selection_List : in out A_SELECTION_ARRAY;
                        Selection      : in     A_SELECTION_DESCRIPTOR) is separate;

  procedure Monitor is new BI_1553_INTERFACE.MONITOR_RT(A_MESSAGE_ARRAY);

  procedure Display_Data (Selection : in     A_SELECTION_DESCRIPTOR) is separate;

begin

  Start_Display;
  Put_At(24,1,"Reading microcode: " & Microcode_Filename);
  Read_Microcode(Microcode_Filename,MicroCode_ID,Mic_Error);
  if Mic_Error /= SUCCESS then
    raise MICROCODE_ERROR;
  end if;
  Put_At(24,1,"                                                                    ");
  Start_Input;
```

```
Assign(Information.Message, "                                    Waiting For Command");
Write(Information);

loop
  Get_Next_Command(Command_Rec);
  case Command_Rec.Command is
    when NONE =>
     null;
    when SELECT_RT =>
     New_Sel := Get_Selection_Data(Command_Rec.Command_Data(1..Command_Rec.Data_Lenght));
     Initialize(Monitor_RT, Interface_Loaded, MicroCode_ID, New_Sel);
     if Monitor_RT(New_Sel.RT) and New_Sel.Active then
       if First_RT_Selected then
         Mode := RAW_DATA;
         Mode_Change := TRUE;
         Format := HEX;
         Format_Change := TRUE;
         First_RT_Selected := FALSE;
       end if;
       Current_Sel(Next_Sel) := New_Sel;
       Last_Sel := Next_Sel;
       Rotate(Next_Sel);
     end if;
    when MODE_HEX =>
     Format := HEX;
     Format_Change := TRUE;
    when MODE_DECIMAL =>
     Format := DEC;
     Format_Change := TRUE;
    when MODE_BINARY =>
     Format := BIN;
     Format_Change := TRUE;
    when MODE_OCTAL =>
     Format := OCT;
     Format_Change := TRUE;
    when MODE_PREFERRED_DATA =>
     Mode := PRIORITY;
     Mode_Change := TRUE;
    when MODE_RAW_DATA =>
     Mode := RAW_DATA;
     Mode_Change := TRUE;
```

```
            when RESET_DISP =>
              Clear_Display;
            when CANCEL_SELECTION =>
              Deactivate(Current_Sel,Get_Selection_Data(
                    Command_Rec.Command_Data(1..Command_Rec.Data_Lenght)));
            when QUIT =>
              Exit_Loop := TRUE;
            when others =>
              Put_At(23,1,ASCII.bel &
                    "%MON1553-W-UNIMPL, that command is not currently supported.");
          end case;
          exit when Exit_Loop;
          if Mode_Change then
            Set_Mode(Mode);
            Mode_Change := FALSE;
          end if;
          if Format_Change then
            Set_Format(Format);
            Format_Change := FALSE;
          end if;
          case Mode is
            when RAW_DATA =>
              for Sel in A_SELECTION_INDEX loop
                Display_Data(Current_Sel(Sel));
              end loop;
            when PRIORITY =>
              Display_Data(Current_Sel(Last_Sel));
            when others =>
              null;
          end case;
          delay 0.1;
        end loop;

        Shutdown_Input;
        Shutdown_Display;

      exception

        when others =>
          Shutdown_Input;
          Shutdown_Display;
```

```
    raise;

end MONITOR_1553;
```

4.5.1 Ex_1553_Monitor.Rotate

This procedure is simply for implementing a binary up counter with roll over characteristic.

4.5.1.1 Rotate Design Specification Constraints.

n.a.

4.5.1.2 Rotate Design

a. Inputs: Index : A_SELECTION_INDEX

b. Outputs: Index : A_SELECTION_INDEX

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: if Index is less than last increment Index
else set Index to first.

f. Error Handling: none.

g. Used Elements: n.a.

4.5.2 Ex_1553_Monitor.Initialize

Starts the monitoring of a specific RT.

4.5.2.1 Initialize Design Specification Constraints.

n.a.

4.5.2.2 Initialize Design

a. Inputs: Active_RT :AN_RT_SELECTION_TABLE
Interface_Active : AN_INTERFACE_ARRAY
Microcode_Ident : A_MICROCODE_ID
New_Selection : A_SELECTION_DESCRIPTOR

b. Outputs: Active_RT :AN_RT_SELECTION_TABLE
Interface_Active : AN_INTERFACE_ARRAY

c. Local Data: Mic_Error : A_MICROCODE_ERROR
Mon_Statis : A_BUS_STATUS

d. Signals: n.a.

e. Algorithms: If New_Selection not Active_RT then...
If not Interface_Active then Load Microcode_Ident
Start_Monitor(New_Selection)
end if

f. Error Handling: When Mic_Error report error.

g. Used Elements: Procedure Start_Monitor : declared in package BI_1553_Interface.
Procedure Write : declared in package OF_User_Output_Interface.
Procedure Assign : declared in UT_Variable_String.
procedure Load_Microcode : declared in Microcode_1553.

4.5.3 Ex_1553_Monitor.Get_Selection_Data

This function takes a text string containing the selection parrameters entered by a user and converts them to a selection record.

4.5.3.1 Get_Selection_Data Design Specification Constraints.

If the any parameters are out of range the a non active selection is returned and an error message is printed in the Status Area of the output screen.

4.5.3.2 Get_Selection_Data Design

a. Inputs: User_Data : STRING

b. Outputs: A_SELECTION_DESCRIPTOR

c. Local Data: Pos_1 : INTEGER
Pos_2 : INTEGER

Arg : INTEGER
Int_Data : INT_ARRAY
More : BOOLEAN
Selection : A_SELECTION_DESCRIPTOR

d. Signals: n.a.

e. Algorithms: parse String for 5 selection parameters

f. Error Handling: When CONSTRAINT_ERROR write error message, return inactive default record.

g. Used Elements: n.a.

4.5.4 Ex_1553_Monitor.Deactivate

This procedure sets the selected element of a display table to inactive. This stops all data display on this selection and makes it's slot available for reuse.

4.5.4.1 Deactivate Design Specification Constraints.

n.a.

4.5.4.2 Deactivate Design

a. Inputs: Selection_List : A_SELECTION_ARRAY
Selection : A_SELECTION_DESCRIPTOR

b. Outputs: Selection_List : A_SELECTION_ARRAY

c. Local Data: n.a.

d. Signals: n.a.

e. Algorithms: If Selection in Selection_List make inactive.

f. Error Handling: none.

g. Used Elements: n.a.

4.5.5 Ex_1553_Monitor.Display_Data

Read the bus buffer associated with a selection and if new data is present display it on the data output display.

4.5.5.1 Display_Data Design Specification Constraints.

n.a.

4.5.5.2 Display_Data Design

a. Inputs: Selection : A_SELECTION_DESCRIPTOR

b. Outputs: n.a.

c. Local Data: Command_Word : A_DATA_COMMAND_WORD;
Status_Word : A_STATUS_WORD
Message_Form : A_MESSAGE_TYPE
Bus_Message : A_MESSAGE_ARRAY
Time_Tag : A_TIME_TAG
Valid_Cmnd : BOOLEAN

d. Signals: n.a.

e. Algorithms: If Selection active then get bus data.
If bus data current then write data to display.

f. Error Handling: none.

g. Used Elements: Procedure Monitor_RT : declared in package
BI_1553_INTERFACE
Procedure Write : declared in package
OF_USER_OUTPUT_INTERFACE

5 CSCI DATA

The only global data shared between packages is in the form of constant definitions. The remainder of the global data in this CSCI is local to a particular package body. The folowing subparagaphs outline the inter and intra package global data.

5.1 Intra Package Global Data

DUAL_PORT_MANAGER

```
DP_Memory                    | DUAL_PORT_MEMORY                  |
| Global structure to map BIT-3 into
Section_Created              | BOOLEAN                           | FALSE
| Set to true is section didn't preexist.
Section_Mapped               | BOOLEAN                           | FALSE
| Set to true if map function was successful
Lock_Held                    | BOOLEAN                           | FALSE
| Set true if Init lock is aquired.
Lock_Status_Block            | STARLET.LOCK_STATUS_BLOCK_TYPE    |
| Results of request to que Init lock.
DP_Initialized               | BOOLEAN                           | FALSE
| True after first call to Initialize_D._P.
Next_Block_Pnt               | SHORT_INTEGER                     |
| Used to keep place in Next_Block function
MAX_DUAL_PORT_SIZE           | constant                          | 128 * 1024
| 64K Words
BYTE                         | constant                          | 8
| 8 Bits 1 byte
WORD                         | constant                          | 16
| 16 Bits 1 Word
ALLOC_TABLE_SIZE             | constant                          | 1024 * BYTE
| 1K Byte in bits
ALLOC_TABLE_NAME             | constant STRING                   |
"DP_ALLOCATION_TABLE" | name of lock
GSD_Name                     | constant STRING                   | "DUAL_PORT"
| "DUAL_PORT"
Test_Patern_1                | constant UNSIGNED_BYTE            | 16#AA#
Test_Patern_2                | constant UNSIGNED_BYTE            | 16#55#
```

AM_BACKGROUND_MONITOR

```
Current_RT_State_Table      | AN_RT_STATE_ARRAY                |
Past_Duration               | SECONDS                          |
The_Sample_Rate             | SAMPLES_PER_SECOND               |
The_1553_Interface_Unit     | A_Interface_Unit                 |
```

AM_TIMING_PACKAGE

```
CONTEXT_ADR                 |                                  |
CONTEXT'ADDRESS
```

BI_1553_INTERFACE

```
Offsets                     | AN_RT_OFFSET_POINTER             | null
| Byte offsets to Subaddress Buffers
Data                        | SYSTEM.ADDRESS                   | ADDRESS_ZERO
| Begining address of dual port block
Rec_SA                      | A_SUBADDRESS_POINTER_TABLE       | (others =>
ADDRESS_ZERO)  | Addresses of Receive SA buffers
Trx_SA                      | A_SUBADDRESS_POINTER_TABLE       | (others =>
ADDRESS_ZERO)  | Addresses of Transmit SA buffers
Status                      | A_STATUS_WORD                    |
Default_Status_Word       | Current status responce for RT
Time                        | A_SUBADDRESS_TIME_TABLE          | (others => 0)
| The relative time of the last message
Runing                      | BOOLEAN                          | FALSE
| Flag true if Start_RT successfull
Bus_Num                     | INTERFACE_1553.A_BUS_NUMBER      |
RT_Num                      | AN_RT_DESCRIPTOR_TABLE           |
RT_Table                    | AN_INTERFACE_TABLE               |
| Struture to competely describe hardware environment.
Interface                   | A_INTERFACE_UNIT                 |
| Globally visable object to hold interface number.
Unit_Selected               | BOOLEAN                          | FALSE
|                           | Flag to indicate if a call to Select_Unit has been
```

```
made.
RT_Control_Block_Base       | constant                    | 16#0800# | rt
control block base                  |
RT_Ctrl_Blk_ESW             | constant                    | 16#0000# |
emulator status word offset         |
RT_Ctrl_Blk_ECW             | constant                    | 16#0001# |
emulator control word offset        |
RT_Ctrl_Blk_Last_Cmd        | constant                    | 16#0002# |
last comand offset                  |
RT_Ctrl_Blk_BJW             | constant                    | 16#0003# |
bit jump word offset                |
RT_Ctrl_Blk_VEC             | constant                    | 16#0004# |
interrupt vector offset             |
RT_Ctrl_Blk_BAP             | constant                    | 16#0005# |
buffer address pointer offset       |
RT_Ctrl_Blk_CAP             | constant                    | 16#0006# |
chain address pointer               |
RT_Ctrl_Blk_ATP             | constant                    | 16#0007# |
address table pointer               |
RT_Ctrl_Blk_STAT            | constant                    | 16#0008# |
status word offset                  |
RT_Ctrl_Blk_OMD             | constant                    | 16#0009# |
output mode data offset             |
RT_Ctrl_Blk_MCW             | constant                    | 16#000a# |
memory control word offset          |
RT_Ctrl_Blk_ATBA            | constant                    | 16#000b# |
address table base address offset   |
RT_Ctrl_Blk_IMD             | constant                    | 16#000c# |
input mode data offset              |
RT_Ctrl_Blk_MSGC            | constant                    | 16#000d# |
message counter offset              |
RT_Ctrl_Blk_MM1             | constant                    | 16#000e# |
mode mask 1 offset                  |
RT_Ctrl_Blk_MM2             | constant                    | 16#000f# |
mode mask 2 offset                  |
RT_Ctrl_Blk_UCBH            | constant                    | 16#0010# |
UCB high offset                     |
```

```
RT_Ctrl_Blk_UCBL          | constant                    | 16#0011# |
UCB low offset                                          |
RT_Ctrl_Blk_DLAY          | constant                    | 16#0012# |
delay offset                                            |
RT_Ctrl_Blk_CMD2          | constant                    | 16#0014# |
command word 2 offset                                   |
RT_Ctrl_Blk_SUBA          | constant                    | 16#0015# |
subaddress offset                                       |
RT_Ctrl_Blk_MSGT          | constant                    | 16#0016# |
message type offset                                     |
RT_Ctrl_Blk_BFHI          | constant                    | 16#0018# |
buffer address high offset                              |
RT_Ctrl_Blk_BFLO          | constant                    | 16#0019# |
buffer address low offset                               |
RT_Ctrl_Blk_MCHI          | constant                    | 16#001a# |
msg ctr high address offset                             |
RT_Ctrl_Blk_MCLO          | constant                    | 16#001b# |
msg ctr low address offset                              |
RT_Ctrl_Blk_HSHK          | constant                    | 16#001d# |
handshake flag offset                                   |
RT_Ctrl_Blk_SYNC          | constant                    | 16#001e# |
sync type msg flag offset                               |
RT_Ctrl_Blk_MCYC          | constant                    | 16#001f# |
minor cycle offset                                      |
RT_Ctrl_Blk_RBUF          | constant                    | 16#0020# |
receive buffer offset                                   |
RT_Ctrl_Blk_CARB          | constant                    | 16#0021# |
circular asynch. rcv buffer offset                      |
RT_Ctrl_Blk_TBUF          | constant                    | 16#0022# |
transmit buffer offset                                  |
RT_Ctrl_Blk_CATB          | constant                    | 16#0023# |
circular asynch xmt buffer                              |
RT_Ctrl_Blk_RCBH          | constant                    | 16#0024# |
receive circular buffer head offset                     |
RT_Ctrl_Blk_RCBT          | constant                    | 16#0025# |
receive circular buffer tail offset                     |
RT_Ctrl_Blk_TCBH          | constant                    | 16#0026# |
```

```
transmit circular buffer head offset  |
RT_Ctrl_Blk_TCBT            | constant                          | 16#0027# |
transmit circular buffer tail offset  |
RT_Ctrl_Blk_INF1            | constant                          | 16#0028# |
info 1 offset                         |
RT_Ctrl_Blk_INF2            | constant                          | 16#0028# |
info 1 offset                         |
RT_Ctrl_Blk_SRCV            | constant                          | 16#0029# |
synch rcv count offset                |
RT_Ctrl_Blk_SXMT            | constant                          | 16#002a# |
synch xmt count offset                |
RT_Ctrl_Blk_ARCV            | constant                          | 16#002b# |
asynch rcv count offset               |
RT_Ctrl_Blk_AXMT            | constant                          | 16#002c# |
asynch xmt count offset               |
RT_Ctrl_Blk_QV0             | constant                          | 16#0030# |
queued vector 0 offset                |
RT_Ctrl_Blk_SRBH            | constant                          | 16#0038# |
synch rcv buffer high offset          |
RT_Ctrl_Blk_SRBL            | constant                          | 16#0039# |
synch rcv buffer low offset           |
RT_Ctrl_Blk_STBH            | constant                          | 16#003a# |
synch xmt buffer high offset          |
RT_Ctrl_Blk_STBL            | constant                          | 16#003b# |
synch xmt buffer low offset           |
INTERFACE_AT_BASE           | constant                          | 16#1000# |
base address of offset table in interface local ram
UNIBUS_BASE_ADDRESS         | constant                          | 8#000000#|
base address of dual port memory on the unibus
Default_Status_Word         | constant A_STATUS_WORD            |
(0,FALSE,FALSE,FALSE,FALSE,
```

EX_1553_MONITOR

```
Monitor_RT                  | AN_RT_SELECTION_TABLE             | (others =>
FALSE)
Interface_Loaded            | AN_INTERFACE_ARRAY                | (others =>
```

```
FALSE)
Current_Sel                  | A_SELECTION_ARRAY                 |
Next_Sel                     | INTEGER                           |
A_SELECTION_INDEX'first
Last_Sel                     | INTEGER                           |
A_SELECTION_INDEX'first
New_Sel                      | A_SELECTION_DESCRIPTOR            |
Mode                         | A_MONITOR_MODE                    | BUS_STATUS
Format                       | A_FORMAT_MODE                     |
Mode_Change                  | BOOLEAN                           | FALSE
Format_Change                | BOOLEAN                           | FALSE
Exit_Loop                    | BOOLEAN                           | FALSE
First_RT_Selected            | BOOLEAN                           | TRUE
Command_Rec                  | A_VALID_COMMAND_RECORD            |
Information                  | A_MESSAGE_DATA_BLOCK(TEXT)        |
Error_Text                   | A_MESSAGE_DATA_BLOCK(ERROR)       |
MicroCode_ID                 | A_MICROCODE_ID                    |
Mic_Error                    | A_MICROCODE_ERROR                 |
Microcode_Filename           | constant STRING                   |
"1553$DISK|[ATIP.DEV.MICROCODE]BUSMON3.LIS"
```

INTERFACE_1553

```
Registers                    | A_Register_Map                    |
Interface_Mapped             | Boolean                           | FALSE
Setup_File_Read              | Boolean                           | FALSE
Unit_Status                  | A_UNIT_STATUS                     |
(NOT_INSTALLED,
Base_Address                 | A_BASE_ADDRESS                    |
Base_CSR                     | A_CSR_ADDRESS                     |
Unit_Num                     | A_INTERFACE_UNIT                  |
Interface_Error              | A_INTERFACE_ERROR                 |
Setup_File_Name              | constant string                   | "PORTS_1553"
SOURCE_BASE_REG_ADDR         | constant A_TBUS_ADDRESS           | 16#2007#
DESTINATION_BASE_REG_ADDR    | constant A_TBUS_ADDRESS           | 16#200F#
IO_BASE_ADDRESS              | constant A_TBUS_VALUE             | 16#2000#
BUS_REGISTER_PRIME           | constant A_TBUS_ADDRESS           | 16#2003#
```

BUS_REGISTER_ALTER	constant A_TBUS_ADDRESS	16#200B#
HOST_DATA	constant A_TBUS_ADDRESS	16#0013#
HOST_COMMAND	constant A_TBUS_ADDRESS	16#0010#
HOST_REQUEST	constant A_TBUS_VALUE	16#0001#
TIMER_ADDRESS	constant A_TBUS_ADDRESS	16#2020#

IP_USER_COMMAND_INTERFACE

Command_Que	A_FIFO_QUEUE	

MICROCODE_1553

New_Id	A_MICROCODE_ID	0
Microcode_List	A_MICROCODE_LIST	

OF_USER_OUTPUT_INTERFACE

Main_Display	A_BUFFER_ID	
Message_Screen	A_BUFFER_ID	
Error_Screen	A_BUFFER_ID	
Raw_Data_Screens	A_RAW_DATA_SCREEN_TABLE	
Priority_Screens	A_PRIORITY_DATA_SCREEN_TABLE	
RT_Activity	A_BUFFER_ID	
Formated_Screen	A_BUFFER_ID	
Logging_Screen	A_BUFFER_ID	
Bus_Stat_Screen	A_BUFFER_ID	
Data_Screen	A_BUFFER_ID	
Display_Pages	A_DISPLAY_TABLE	
RATE_CHANGE	BOOLEAN	TRUE

SCREEN_MANAGER

Screen_Buffer	A_SCREEN_MANAGEMENT_BUFFER	
Next_Buffer	A_BUFFER_ID	
A_BUFFER_ID'first		
More_Buffers	BOOLEAN	TRUE
CSI	constant STRING	ASCII.esc &

```
"["
POSLEN                          | constant INTEGER                  | CSI'length +
2 | CSI length +  length + f length
ATRCHR                          | constant AN_ATTRIBUTE_TABLE       |
('0','1','4','5','7')
```

UNBOUNDED_FIFO_QUEUE

```
Master_Key                      | AN_ENTRY_KEY                      |
AN_ENTRY_KEY'first
```

VT200_SPECIAL_IO

```
ESC                             | constant CHARACTER                | ascii.esc
CTL                             | constant STRING(1..2)             | ESC & '['
Escape_Sequence                 | constant SCREEN_CODES             | (INVERSE
=> (6,4, CTL & "7m  "),
Attribute_On                    | constant ATTRIBUTE_CODES          | (INVERSE_TXT
=> (5,4, CTL & "7m "),
Attribute_Off                   | constant ATTRIBUTE_CODES          | (INVERSE_TXT
=> (5,5, CTL & "27m"),
All_Off                         | constant STRING                   | CTL &
"022242527m"
Turn_Cursor_On                  | constant STRING                   | CTL & "?25h"
Turn_Cursor_Off                 | constant STRING                   | CTL & "?251"
```

5.2 Inter Package Global Definitions

OF_LOCAL_SPECS

```
MAX_NUMBER_RT_DISPLAYS          | constant                          | 2
MAIN_HEADER_ROW1                | constant NATURAL                  | 1
MAIN_HEADER_COL1                | constant NATURAL                  | 1
SEC_HEADER_ROW1                 | constant NATURAL                  | 2
SEC_HEADER_COL1                 | constant NATURAL                  | 1
SEC_HEADER_COL2                 | constant NATURAL                  | 20
SEC_HEADER_COL3                 | constant NATURAL                  | 32
```

```
SEC_HEADER_COL4          | constant NATURAL          | 51
SEC_HEADER_COL5          | constant NATURAL          | 71
THRID_HEADER_ROW1        | constant NATURAL          | 3
THRID_HEADER_COL1        | constant NATURAL          | 1
THRID_HEADER_ROW2        | constant NATURAL          | 4
WORK_COMMAND_SEP_ROW     | constant NATURAL          | 22
WORK_COMMAND_SEP_COL     | constant NATURAL          | 1
DISPLAY_START_ROW        | constant NATURAL          | 4
DISPLAY_STOP_ROW         | constant NATURAL          | 21
DISPLAY_START_COL        | constant NATURAL          |
MAIN_HEADER_COL1
ACT_MON_ROW              | constant NATURAL          | 2
ACT_MON_COL              | constant NATURAL          | 10
TEXT_HEADER_ROW          | constant NATURAL          | 8
TEXT_HEADER_COL          | constant NATURAL          | 30
ERROR_HEADER_ROW         | constant NATURAL          | 8
ERROR_HEADER_COL         | constant NATURAL          | 30
TEXT_ROW                 | constant NATURAL          | 10
TEXT_COL                 | constant NATURAL          | 1
ERROR_ROW                | constant NATURAL          | 10
ERROR_COL                | constant NATURAL          | 1
RT_ACT_ROW1              | constant NATURAL          |
THRID_HEADER_ROW1
RT_ACT_ROW2              | constant NATURAL          |
THRID_HEADER_ROW2
RT_ACT_COL               | constant NATURAL          |
THRID_HEADER_COL1 + 6
RT_OFFSET_ROW1           | constant NATURAL          | 4
RT_OFFSET_ROW2           | constant NATURAL          | 3
RT_SA_BN_COL             | constant NATURAL          | 6
RT_HEADER_ROW            | constant NATURAL          | 6
SA_HEADER_ROW            | constant NATURAL          | 7
BN_HEADER_ROW            | constant NATURAL          | 8
RT_RT_HEADER_OFFSET      | constant NATURAL          | 35
WORK_AREA_OFFSET         | constant NATURAL          | 14
BIN_WORK_AREA_OFFSET     | constant NATURAL          | 30
NUMBER_OFFSET            | constant NATURAL          | 8
```

```
START_AREA_WORK_ROW          | constant NATURAL                | RT_HEADER_ROW
DATA_OFFSET                  | constant NATURAL                | 11
WORK_AREA_COL1               | constant NATURAL                | RT_SA_BN_COL
+ DATA_OFFSET
WORK_AREA_COL2               | constant NATURAL                | RT_SA_BN_COL
+ DATA_OFFSET + BIN_WORK_AREA_OFFSET
RT_HEADER_COL                | constant NATURAL                | 3
HEADER_AREA_OFFSET           | constant NATURAL                | 20
RAW_DATA_BIN_OFFSET          | constant NATURAL                | 23
RAW_DATA_DEF_OFFSET          | constant NATURAL                | 14
PRIORITY_COL                 | constant NATURAL                | 2
PRIORITY_ROW                 | constant NATURAL                | 10
PRIORITY_HEADER_ROW          | constant NATURAL                | 6
PRIORITY_HEADER_COL          | constant NATURAL                | 30
PRIORITY_CMD_COL             | constant NATURAL                | PRIORITY_COL
+ 25
PRIORITY_CMD_ROW             | constant NATURAL                | PRIORITY_ROW
+ 9
PRIORITY_STS_ROW             | constant NATURAL                |
PRIORITY_CMD_ROW + 1
PRIORITY_CMD_OFFSET          | constant NATURAL                | 10
LOGGING_ROW                  | constant NATURAL                | 11
LOGGING_COL                  | constant NATURAL                | 30
BLANK_LINE                   | constant STRING(1..80)          | (others => '
')
NORMAL_TEXT                  | constant A_SCREEN_ATTRIBUTE     | Atr(NORMAL)
UNDERLINE_TEXT               | constant A_SCREEN_ATTRIBUTE     |
Atr(UNDERLINE)
BOLD_TEXT                    | constant A_SCREEN_ATTRIBUTE     | Atr(BOLD)
BLINKING_TEXT                | constant A_SCREEN_ATTRIBUTE     | Atr(BLINKING)
INVERSE_TEXT                 | constant A_SCREEN_ATTRIBUTE     | Atr(INVERSE)
BLINKING_INVERSE_TEXT        | constant A_SCREEN_ATTRIBUTE     | BLINKING and
INVERSE
BOLD_UNDERLINE_TEXT          | constant A_SCREEN_ATTRIBUTE     | BOLD and
UNDERLINE
BLINKING_UNDERLINE_TEXT      | constant A_SCREEN_ATTRIBUTE     | BLINKING and
UNDERLINE
```

```
INVERSE_UNDERLINE_TEXT      | constant A_SCREEN_ATTRIBUTE      | INVERSE and
UNDERLINE
BOLD_INVERSE_TEXT           | constant A_SCREEN_ATTRIBUTE      | BOLD and
INVERSE
BOLD_INVERSE_UNDERLINE_TEXT | constant A_SCREEN_ATTRIBUTE      | BOLD and
INVERSE and UNDERLINE
DATA_POSITION               | constant A_DISPLAY_FORMAT_TABLE  |
PRIORITY_POS                | constant A_PRIORITY_FORMAT_TABLE |
```

BI_1553_WORD_DEFINITIONS

```
Broadcast_Address           |constant A_REMOTE_TERMINAL_ADDRESS| 2#11111#;
Mode_Command_1              | constant A_SUBADDRESS            | 2#11111#;
Mode_Command_2              | constant A_SUBADDRESS            | 2#00000#;
```

6 CSCI DATA FILES

6.1 Data File to CSC-CSU Cross Reference

Data file PORTS_1553 used by INTERFACE_1553

6.1.1 PORTS_1553.

This file contains information on the type of CPU, number of UNIBUS channels, number of interfaces, and IO register addresses for the target platform. The file is order dependent, the data may have any number of comments between it but each item must be a on a separate line, and must come in the specified order. The semicolon (;) is the comment character.

IO_BASE_PAGE_ADDRESS - this is the VAX address of the io page buffer in hex

Range: <implementation dependant>

Units: UNSIGNED

TOTAL_NUMBER_MMBI_INSTALLED - the number of interface adaptor units on this CPU

Range : 1..4

Units: UNSIGNED

UNIT_ASSIGNMENTS - one definitin per MMBI installed

UNIT # CSR - octal representation of the control status register address for the interface

Range: 766000_8 .. 766100_8

Units: UNSIGNED

8 NOTES

8.1 Definition Of Terms and Abbreviations

AN/AYK	-	(Navy standard embedded mission processor)
ATIP	-	Ada Technology Insertion Program
BC	-	Bus Controller
CSCI	-	Computer Software Configuration Item.
CSU	-	Computer Software Unit.
CTSD	-	Computer Technology and Simulation Department.
DCL	-	Digital Command Language
DEC	-	Digital Equipment Corporation
GADBTK	-	Generic Avionics Data Bus Tool Kit
RT	-	Remote Terminal
UART	-	Universal Asyncronous Receiver / Transmitter
VAX	-	Virtual Address Extension (DEC mini computer architecture)
VMS	-	Virtual Memory System (VAX operating system)

APPENDIX A

10 Requirements Model Dictionary

10.1 Data Flows

Bus_Activity =
BNF: {RT_Status}

Bus_Data =
BNF: [RT_Status | Bus_Message]

Bus_Message =
BNF: {Bus_Word}

Captured_Data =
BNF: {Bus_Word}

Composed_Command =
BNF: *Current_Command* + User_Data

Configuration_Info =
BNF: Default_Bus_Number + Interface_Number + Interface_Address
+ Machine_Type

Data_Received =
BNF: {Bus_Word}

Data_Scale_Definition =
BNF: {Message_Id + Word_Num + LSB + MSB + Scale_Factor}

Data_Selection =
BNF: RT_Num + (SA_Num) + (Tran_Rec) + (Bus_Num) + (Watch_Mask)

Data_To_Transmit =
BNF: {Bus_Word}

Device_Parameters =

BNF: Num_Lines + Num_Cols + Esc_Clear + Esc_Pos + Esc_Line + Esc_Bold + Esc_Hilite + Esc_Blink

Message_Data =

BNF: Message_ID_Block + Message_Content

Message_ID_Block =

BNF: Message_Type + (Window_Id)

Next_Command =

BNF: Current_Command

Raw_Bus_Data =

BNF: {Bus_Word}

Scaled_Data =

BNF: {Bus_Word}

Screen_Layout =

BNF: Elements + {Title + Line + Column + Units + Width}

Text_Data =

BNF: {Bus_Word_Srting}

Transmit_Data =

BNF: {Bus_Word}

User_Data =

BNF: [RT_Num | SA_Num | Tran_Rec | Bus_Num | Bus_Message | Out_File | Update_Rate | Current_Mode | Watch_Mask]

Verified_Data =

BNF: {Bus_Word}

10.2 Data Stores

Command_History =
BNF: {Composed_Command}

Command_Que =
BNF: {Current_Command}

Data_Format_Table =
BNF: {Valid_Input_Format}

Data_Scaling_Table =
BNF: {Data_Scale_Definition}

Device_Parameter_Table =
BNF: {Device_Name + Device_Parameters}

Output_Format_Table =
BNF: {Screen_Layout}

Valid_Command_Table =
BNF: {Valid_Command}

10.2 Terminators

1553_Bus =

Bus_Configuration_File =

History_File =

User =

10.2 Processes

Activity_Monitor =

As_Text =

Bus_Interface =

Bus_Monitor =

Bus_Receiver =

Bus_Transmiter =

Compare_Commands =

Data_Manager =

Disable_Com_Firmware =

Dispatch_Command =

Format_Data =

Get_Command =

Get_User_Data =

Initialize_Bus_Hardware =

Initiate_Com_Firmware =

Input_Parser =

Interpreter =

Mode_Control =

Monitor_EXEC =

Output_Formater =

Output_Mode =

Scale_Data =

Screen_Interface =

Update_Clock =

Update_Counter =

Validate_Command =

Verify_Data =

10.2 Control Flows

Get_Data =

Init_Interface =

Read_Data =

Resume_Command_Entry =

Start_Emu =

Start_Log =

Stop_Emu =

Stop_Log =

Update_Screen =

Write_Data =

10.3 Primitives

Bus_Num =
Data Type: Integer
Data Representation: numeric
Data Size: 4 bytes
Data Range: (1, 8)
Default Value: 1

Bus_Word =
Data Type: Unsigned_Word
Data Representation: numeric
Data Size: 2 bytes
Data Range: (0, 65536)
Bits: 16

Bus_Word_Srting =
BNF: {Character}
Data Type: String
Data Representation: alpha-numeric

Column =
Data Type: Integer
Data Representation: numeric
Data Range: (0, 132)
Default Value: 0

Command =
BNF: {Character}
Comments: Command input from user is an unformated string that must match one of the valid commands.
Data Type: String
Data Representation: alpha_numeric
Data Size: 80 bytes

Commanded_Mode =

BNF: [Hex + Decimal + Octal + Binary + Formated + Activity + Prefered_Data + Idle + Logging]

Data Type: Mode_Type

Current_Command =

BNF: [Select_RT + Select_SA + Select_TR + Select_Bus + Set_Display_Mode + Set_Log_Mode + Start_Loging]

Data Type: Command_Type

Data Representation: Enumeration

Current_Mode =

BNF: [Hex + Decimal + Octal + Binary + Formated + Activity + Prefered_Data + Idle + Logging]

Data Type: Mode_Type

Default_Bus_Number =

Comments: MFS data bus selection

Data Type: Bus_Num

Data Representation: enumeration

Device_Name =

BNF: [VT100 + VT200 + UNKNOWN]

Data Type: Terminal_Device_Type

Data Representation: enumeration

Default Value: VT200

Elements =

Comments: Number of Entries on the particular screen

Data Type: Natural

Data Representation: numeric

Data Range: (0, 3168)

Esc_Blink =

BNF: {Character}

Comments: Output device escape sequence to set blinking atributre on chracters.

Data Type: String

Data Representation: alpha-numeric

Esc_Bold =

BNF: {Character}

Comments: Escape sequence to set bold atribute on output device.

Data Type: String

Data Representation: alpha-numeric

Esc_Clear =

BNF: {Character}

Comments: Escape sequence to clear the screen on the output device

Data Type: String

Data Representation: alpha-numeric

Esc_Hilite =

BNF: {Character}

Comments: Escape sequence to set the hilite atribute for the output device.

Data Type: String

Data Representation: alpha-numeric

Esc_Line =

BNF: {Character}

Comments: Escape sequence to cause a line to be drawn on the output device.

Data Type: String

Data Representation: alpha-numeric

Esc_Pos =

BNF: {Character}

Comments: Escape sequence to position the cursor on the output device.

Data Type: String

Data Representation: alpha-numeric

Input_Command =

BNF: {Character}

Comments: Formated text string containing a user command

Data Type: String

Data Representation: alpha-numeric

Input_Data =
BNF: {Character}
Data Type: String
Data Representation: alpha-numeric

Interface_Address =
Comments: CSR address of VAX 1553 interface card
Data Type: Address
Data Representation: numeric

Interface_Number =
Comments: MFS unibus interface number
Data Type: Integer
Data Representation: numeric
Data Range: (1, 4)
Default Value: 1

Line =
Data Type: Integer
Data Representation: numeric
Data Range: (0, 24)
Default Value: 0

Log_File_Name =
BNF: {Character}
Data Type: String
Data Representation: alpha-numeric
Default Value: "BUS_LOG.OUT"

LSB =
Comments: Least Significant Bit of data
Data Type: Integer
Data Representation: numeric

Machine_Type =

BNF: [VS3200 + MVII + V780 + V6X + V8X + AYK]

Comments: Type of computer the software is exucuting on

Data Type: A_Machine_Type

Data Representation: enumeration

Message_Content =

BNF: [{Character} | {Bus_Word}]

Comments: This field contains the text of the message to be displayed

Data Type: String

Data Representation: alpha-numeric

Message_Id =

Comments: The message number associated with the descriptor

Data Type: Integer

Data Representation: numeric

Message_Type =

BNF: [Info + Error + Bus_Data + Prompt]

Data Type: Output_Message_Type

Data Representation: enumeration

MSB =

Comments: Most Significant Bit of the message data

Data Type: Integer

Data Representation: numeric

Numeric_Data =

BNF: {Integer}

Data Type: Numeric_Display_Data

Num_Cols =

Comments: Maximum number of colomns on the output device.

Data Type: Positive

Data Representation: numeric

Data Range: (1, 1024)

Default Value: 80

Num_Lines =

Comments: Number of lines on output device.

Data Type: Positive

Data Representation: numeric

Data Range: (1, 768)

Default Value: 24

Out_File =

BNF: {Character}

Comments: File name of output stream

Data Type: String

Data Representation: alpha-numeric

Receive_Buffer_Address =

Comments: Virtual address of physical memory buffer

Data Type: Address

Data Representation: numeric

RT_Num =

Comments: Remote Terminal address

Data Type: RT_Address_Type

Data Representation: numeric

Data Range: (0, 31)

Bits: 5

RT_Status =

BNF: [Acctive + Inactive + Unknown]

Comments: Most recently obseved status of a given RT

Data Type: An_RT_Status

Data Representation: enumeration

SA_Num =

Comments: Subaddress of selected RT

Data Type: RT_Subaddress_Type

Data Representation: numeric
Data Range: (1, 30)

Scale_Factor =
Comments: The multiplier to convert the raw data number to the internal representation
Data Type: Float
Data Representation: numeric

Screen_Selection =
Comments: Integer to specify screen dislay format to use with current data
Data Type: Integer
Data Representation: numeric-coded

Startup_Vector =
Comments: Microcode starting location
Data Type: Address
Data Representation: numeric

Status =
BNF: [Normal + Bus_Error + User_Error + Config_Error]

Status_Message =
BNF: {Character}
Comments: Errors, warnings, and information associated with the software not the actual bus trafic.
Data Type: String
Data Representation: alphabetic

Title =
BNF: {Character}
Comments: Text to associate with the screen field
Data Type: String
Data Representation: alpha-numeric

Transmit_Buffer_Address =
Comments: Virtual memory address of physical buffer

Data Type: Address
Data Representation: numeric

Tran_Rec =
BNF: [Transmit + Receive]
Comments: Direction of data transfer
Data Type: Data_Direction_Type
Data Representation: enumeration

Units =
BNF: [Seconds + Minutes + Hours + Inches + Feet + Miles + CentiMeters + Meters
+ KiloMeters + Degrees + Semicircles + In_Per_Sec + Ft_Per_Sec + Mi_Per_H
+ M_Per_Sec + Ft_Per_Sec2 + M_Per_Sec2]
Comments: Units to display screen field in.
Data Type: Avionics_Units
Data Representation: enumeration

Update_Rate =
BNF: Seconds
Comments: This message to the output formater expresses how often to refresh the
screen.
Data Type: Integer
Data Representation: numeric
Data Range: (0, 60)
Default Value: 3
Units of Measure: Seconds
Accuracy: 1

Valid_Command =
BNF: [Select_RT + Select_SA + Select_TR + Select_Bus + Set_Display_Mode
+ Set_Log_Mode + Set_Watch + Start_Loging]
Data Type: Valid_Command_Type
Data Representation: Enumeration

Valid_Data =
BNF: [Integer | String | Enumeration]

Comments: This flow contains data that has been verified to be of the format requested the values have not been tested

Valid_Input_Format =

Comments: Template of the input expected to check against actual input.

Watch_Mask =

BNF: {Bits}

Comments: Bit mask to use as logging criteria. (i.e. when pattern is seen on bus log the message)

Data Type: Bit_Array

Data Representation: bolean

Width =

Comments: The number of spaces to use on the output for representing the field.

Data Type: Natural

Data Representation: numeric

Data Range: (0, 132)

Windows =

Comments: The number of data windows to show on the screen at one time.

Data Type: Integer

Data Representation: numeric

Data Range: (1, 4)

Default Value: 1

Window_Id =

Data Type: Integer

Data Representation: numeric

Data Size: 1 byte

Data Range: (1, 4)

Default Value: 1

Word_Num =

Comments: Subaddress word offset

Data Type: An_RT_Word_Number

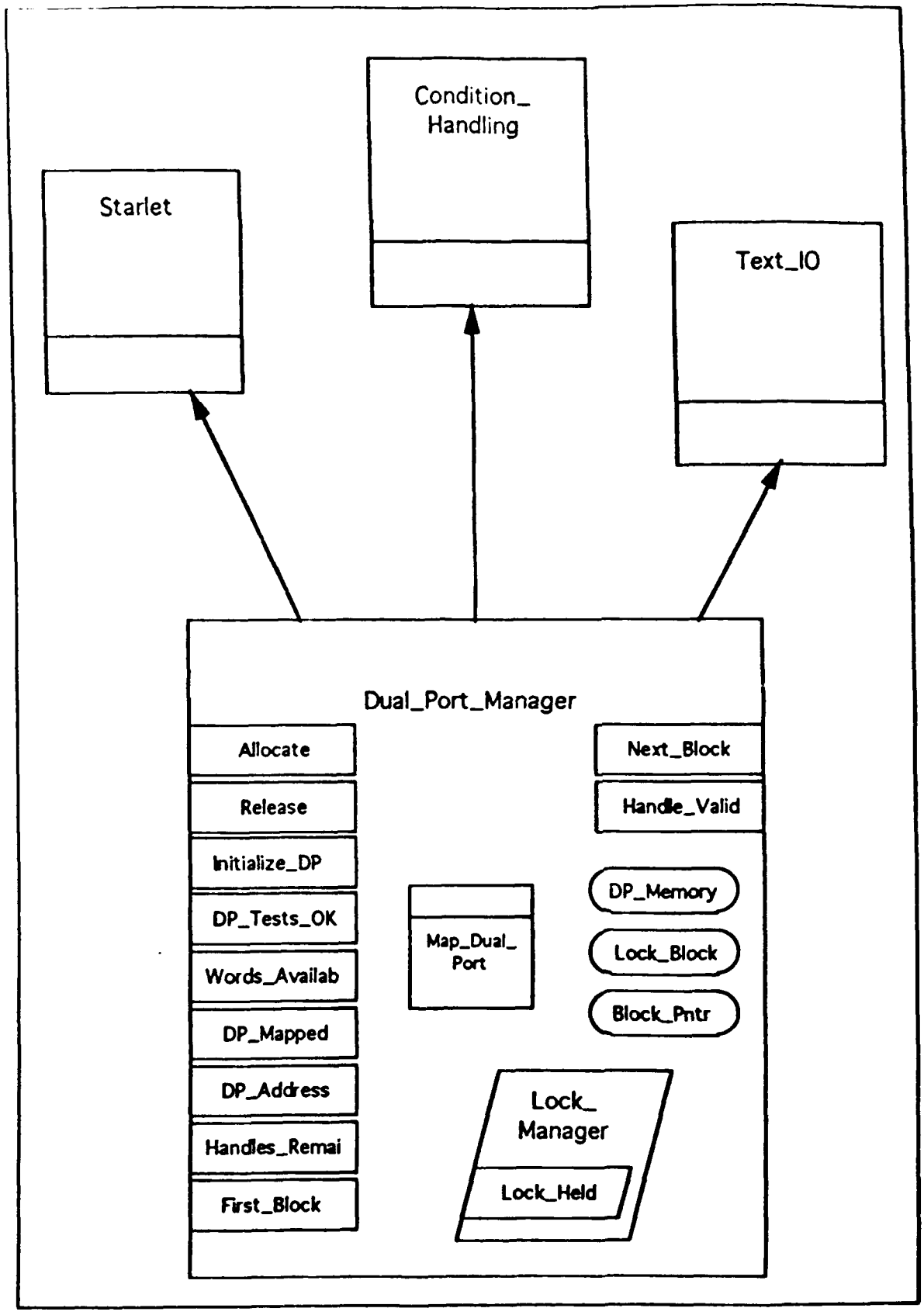
Data Representation: numeric

Data Range: (0, 31)

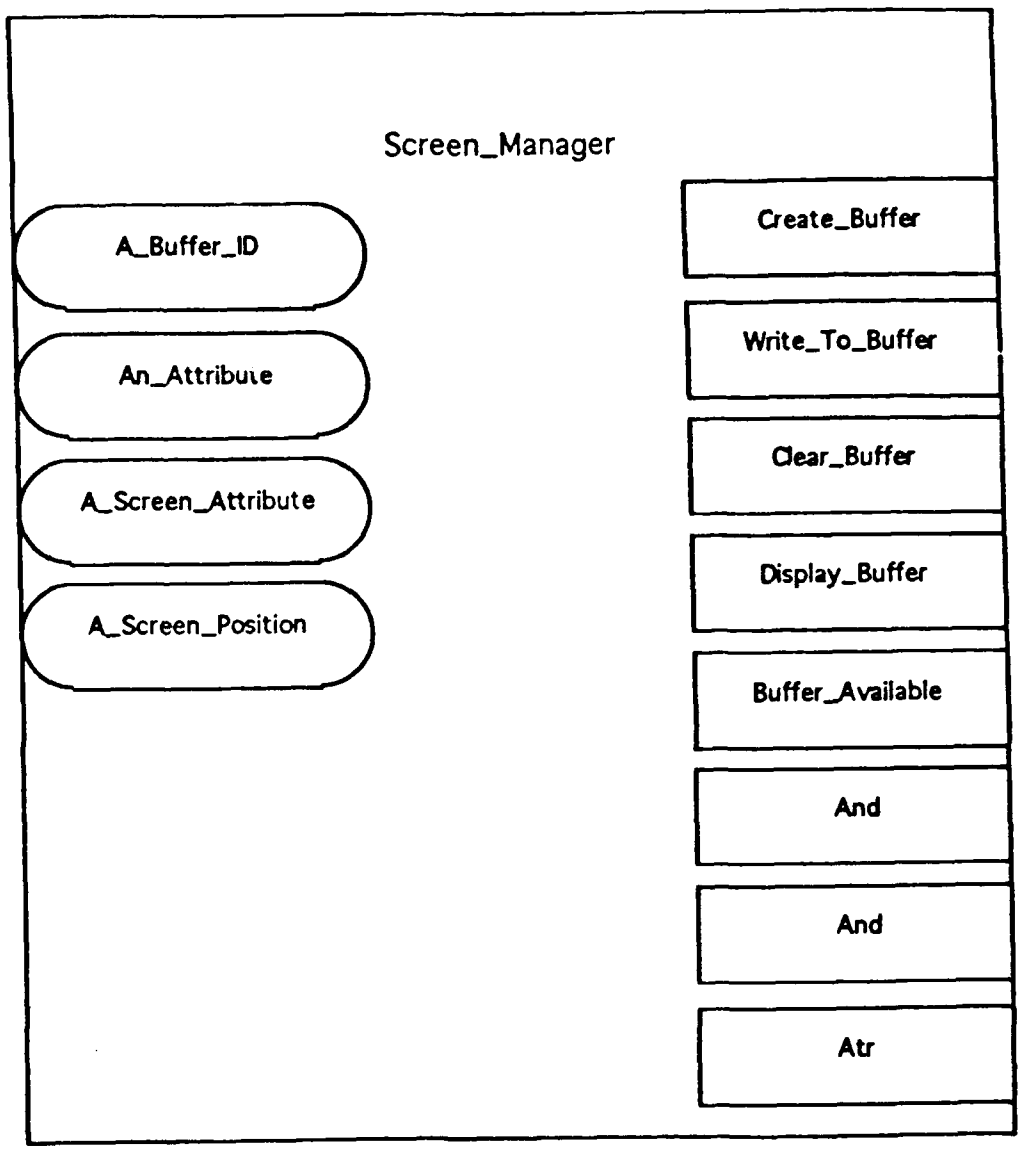
APPENDIX B

10 ADDITIONAL ADA STRUCTURE CHARTS FOR CSC's

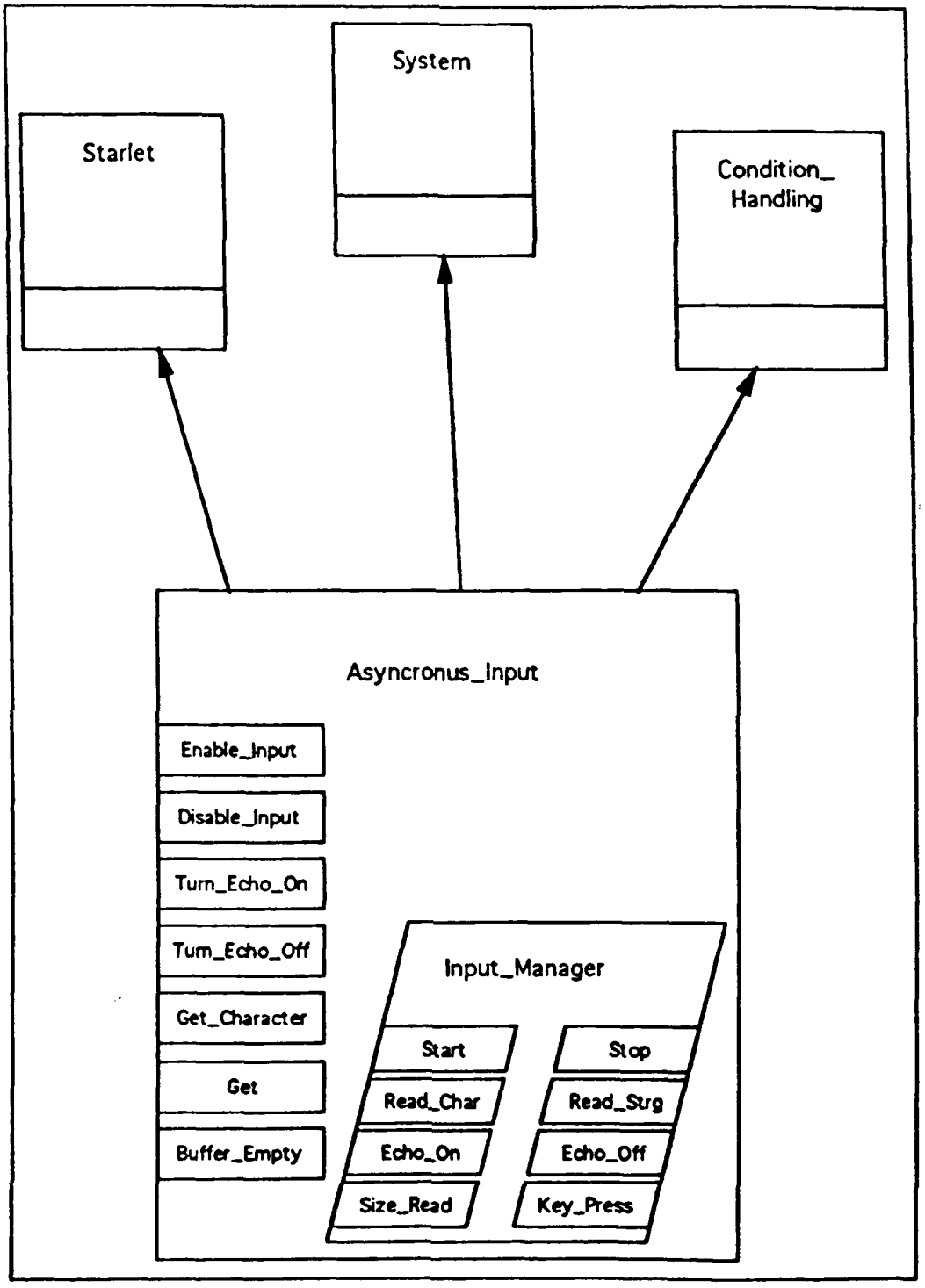
10.1 Daul Port Manager



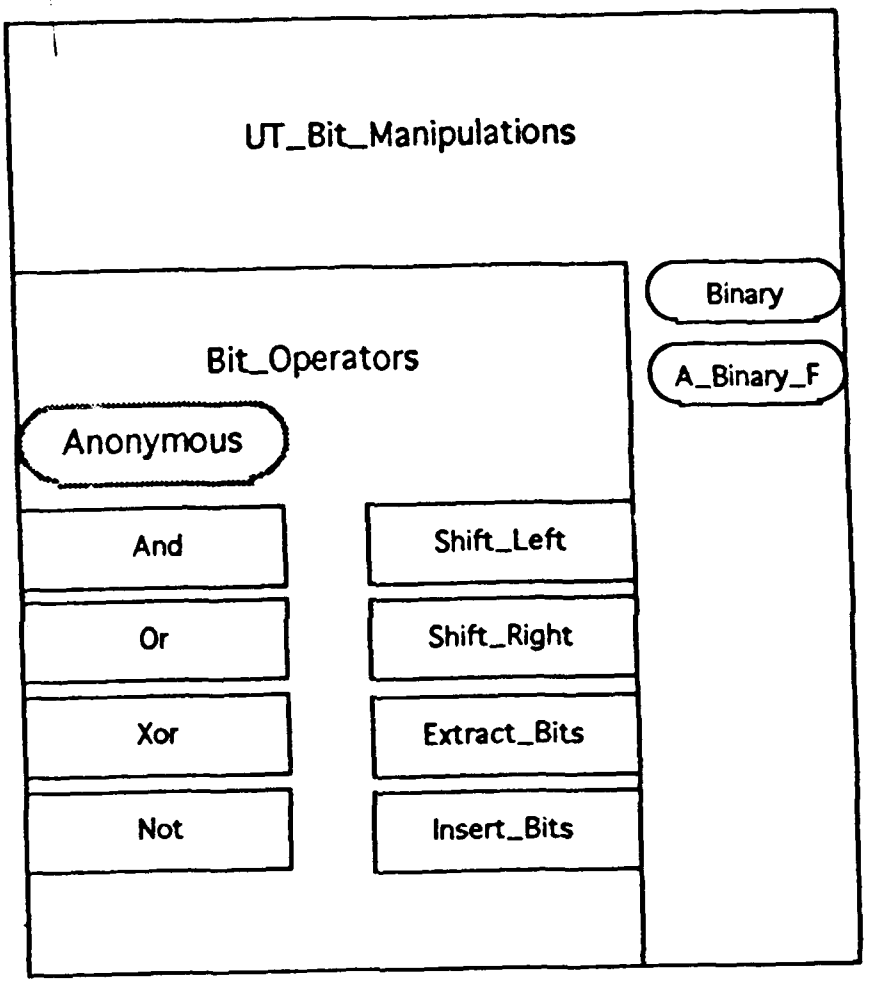
10.2 Screen Manager



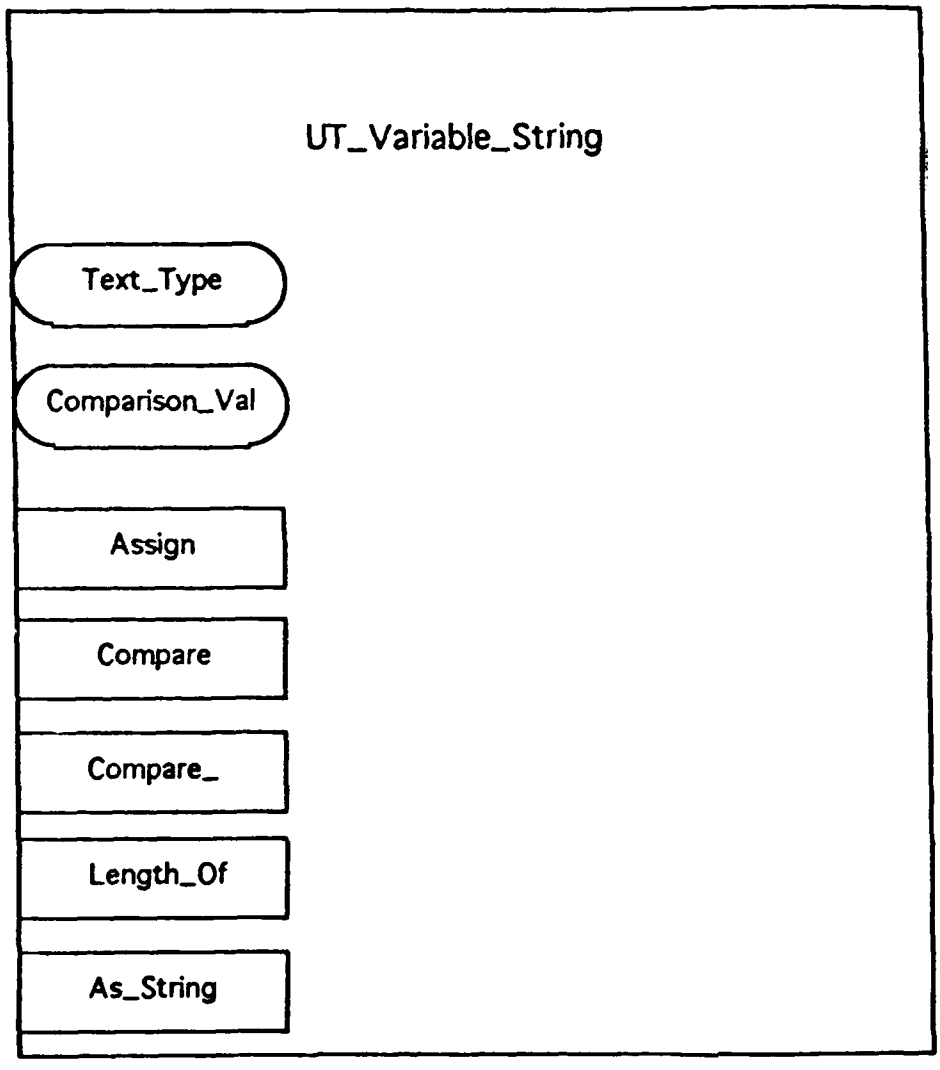
10.3 Asyncronous Input



10.4 UT Bit Manipulations



10.5 UT Variable String



APPENDIX C

10 PROGRAM DEPENDANCY CHART FOR MONITOR APPLICATION